E-WALLET UTILIZATION VIA QR CODE: AN EMPIRICAL STUDY ON RELEVANT PREDICTORS AMONG M40 MILLENNIALS IN MALAYSIA

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ABSTRACT

The Malaysian government is pushing for a cashless society but going cashless is all the rage now. The adoption of e-wallet in Malaysia is still in the infancy stage, and the reasons to explain the behavioural intention to use e-wallet transaction via QR code are remaining unclear. To address these requisites, the purpose of this study is to examine the predictors of the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. An integrative theoretical framework was developed based on the perspectives of the Technology Readiness Index (TRI) and the Unified Theory of Acceptance and Use Technology model (UTAUT). To test the framework, the quantitative approach using the survey method was used. By using a self-administered survey, the data were obtained from 487 respondents from the M40 millennials in Malaysia. The data were then analysed utilising the Partial Least Square Structural Equation Modelling (PLS-SEM) technique. The finding showed that of all the four TRI elements, only optimism and innovativeness are relevant to behavioural intention to use e-wallet transaction via QR code in Malaysia nowadays. Besides, the findings indicate that performance expectancy and effort expectancy in UTAUT have significant positive influences on the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. More importantly, the findings indicated that overall optimism has positive, statistically significant effects on behavioural intention, through the full mediating effect of performance expectancy and effort expectancy. Additionally, innovativeness through the mediating effect of performance expectancy and effort expectancy indicated a partial mediating effect. The results of this study will contribute in terms of theoretical, managerial and methodological perspectives. It will use to contribute to the financial institutions in Malaysia significantly. Nonetheless, further studies are necessary both to confirm the findings and to incorporate additional variables that may influence results. Lastly, limitations and recommendation for future studies are presented.

Keywords: E-Wallet, QR Code, M40 Millennials, Technology Readiness Index, and Unified Theory of Acceptance and Use Technology

ABSTRAK

Kerajaan Malaysia sedang menggalakan untuk masyarakat tanpa tunai, tetapi akan menguruskan semua banjaran kini berada.. E-wallet di Malaysia masih di tahap awal dan sebab-sebab untuk menjelaskan niat tingkah laku untuk menggunakan transaksi e-wallet melalui kod QR masih tidak jelas. Untuk menangani keperluan ini, tujuan kajian ini adalah untuk mengkaji peramal niat tingkah laku untuk menggunakan transaksi e-wallet melalui kod QR di kalangan M40 milenium di Malaysia. Rangka kerja teoritis yang integratif telah dibangunkan berdasarkan perspektif Indeks Kesediaan Teknologi (TRI) dan Model Teknologi Penerimaan dan Penggunaan Teknologi Unified (UTAUT). Untuk menguji rangka kerja ini, pendekatan kuantitatif menggunakan kaedah tinjauan telah digunakan. Dengan menggunakan kaji selidik sendiri, data diperoleh daripada 487 responden dari milenium M40 di Malaysia. Data tersebut kemudiannya dianalisis dengan menggunakan teknik Pemodelan Persamaan Struktur Bahagian Separa Square (PLS-SEM). Penemuan ini menunjukkan bahawa semua empat elemen TRI, hanya optimisme dan inovatif yang berkaitan dengan niat tingkah laku untuk menggunakan transaksi e-wallet melalui kod QR di Malaysia pada masa kini. Selain itu, penemuan menunjukkan bahawa jangkaan prestasi dan jangkaan usaha dalam UTAUT mempunyai pengaruh positif positif terhadap niat tingkah laku untuk menggunakan transaksi e-wallet melalui kod QR di kalangan M40 milenium di Malaysia. Lebih penting lagi, penemuan menunjukkan bahawa optimisme secara keseluruhan mempunyai kesan positif dan positif secara statistik terhadap niat tingkah laku, melalui kesan pengantaraan penuh jangkaan prestasi dan jangkaan usaha. Tambahan pula, usaha jangkaan dan dan jangkaan usaha menunjukkan kesan pengantaraan separa bagi inovatif terhadap niat tingkah laku. Hasil kajian ini akan menyumbang dari perspektif teoritis, pengurusan dan metodologi. Ia akan digunakan untuk menyumbang kepada institusi kewangan di Malaysia dengan ketara. Walau bagaimanapun, kajian lanjut perlu untuk mengesahkan penemuan dan memasukkan pembolehubah tambahan yang mungkin mempengaruhi keputusan. Akhirnya, batasan dan cadangan untuk kajian masa depan dibentangkan.

Kata Kunci: E-Wallet, Kod QR, M40 Millennials, Indeks Kesediaan Teknologi, dan Teori Teknologi Penerimaan dan Penggunaan Bersepadu

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LIST OF ABBREVIATIONS

ATM	Automated Teller Machine
AVE	Average Variance Extracted
B40	Bottom 40 Percent
BI	Behavioural Intention
CAGR	Compound Annual Growth Rate
CMV	Common Method Variance
CMV	Common Method Variance
CR	Ccomposite Reliability
C-TAM & TPB	Combined TAM & TPB
DFTZ	Digital Free Trade Zone
DI	Discomfort
DoSM	Department of Statistics Malaysia
DTPB	Decomposed Theory of Planned Behaviour
EE	Effort Expectancy
EM-IIG	Enhanced Malaysia International Internet Gateway
E-Payment	Electronic payment
EPP	Entry Point Projects
ETP	Economic Transformation Programme
E-Wallet	Electronic Wallet
f^2	Effect Size
FC	Facilitating Conditions
GOF	Goodness–of-Fit
IBM	International Business Machines
IDT	Innovation Diffusion Theory
IN	Innovativeness
IoT	Internet of Things
IS	Information System
IT	Information Technology
ITU	International Telecommunication Union
IY	Insecurity
KMO	Kaiser-Meyer-Olkin

KRI	Khazanah Research Institute
M40	Middle 40 Percent
MCMC	Malaysian Communications and Multimedia Commissions
M-Commerce	Mobile Commerce
MM	Motivational Model
MPCU	Model of PC Utilization
OP	Optimism
PE	Performance Expectancy
PIN	Personal Identification Number
PLS	Partial Least Square
POS	Point of Sale
Q^2	Q-Square
QR	Quick Response
R^2	R square
S.E.	Standard Error
SCT	Social Cognitive Theory
SEM	Structural Equation Modeling
SI	Social Influence
SMS	Short Message Service
SN	Social Norm
SPSS	Statistical Package for Social Sciences
SSTs	Self-Service Technologies
T20	Top 20 Percent
TAM	Technology Acceptance Model
TPB	Theory of Planned Behaviour
TR	Technology Readiness
TRA	Theory of Reasoned Action
TRI	Technology Readiness Index
VAF	Variance Accounted For
VIF	Variance Inflation Factor

CHAPTER ONE

INTRODUCTION

1.1 Background of Study

The banking industry has become more convenient, thanks to the Internet, and the future of banking is becoming more digitalised (LiveBank, 2019; Meola, 2016). Information and communication technologies have dramatically changed our day-to-day lives. It has a greater impact on the business sector. Today, corporate organisations rely on the platform of electronic to achieve commercial accomplishment. As mobile phones have become commonplace for everyday use, the development of mobile telecommunications and information technology (IT) has made a huge impact on the banking industry (Al-Jabri & Sohail, 2012; Courbe, 2016; Foo-Wah, Fakhrorazi, & Islam, 2019). Likewise, it establishes innovative opportunities for financial institutions to implement technological solutions for delivering superior, and value product and services for consumers in order to encourage their online transaction and knowledge exchange (Aboelmaged & Gebba, 2013).

The evolution in banking is a metamorphosis. In an increasingly turbulent environment, the dynamics of banking across the world are becoming more competitive. To attract more and retain existing customers, banks are continually looking for revolutionary solutions that hold their competitiveness (Changchun, Haider, & Akram, 2017; Deloitte, 2018). New transactions and services have continuously exposed their way to the banking halls, but the current technology has accelerated how banking is

performed. On a global scale, banks are exploring how to transform into more digital business models. In the Asian region, banks in Singapore are the most prepared for the digital banking phase, followed by the banks in Malaysian while the banks in other neighbouring countries like Indonesia, Thailand, and Philippine are still lagging behind as shown in Figure 1.1 (DBS Group Research, 2015). When compared to the western world of banking, as shown in Appendix C, digital banking in the Asian region are less ready for digital banking (Kearney. Inc., 2013).

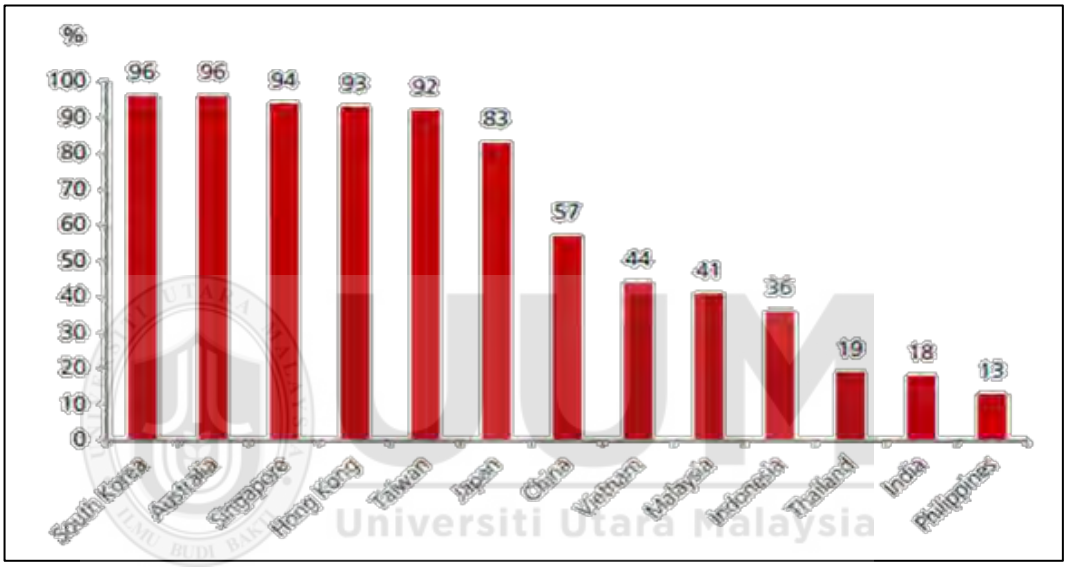


Figure 1. 1: Digital Banking Penetration in Asia
Source: DBS Group Research, (2015)

Malaysia and other government of Southeast Asian are allowed, even encouraged, for this e-wallet battlefield, and the rising internet infrastructure has helped to adopt it (Pikri, 2018). Even in Singapore which our neighbourhood, a country that is considered cutting-edge technology, cash is still the current choice at the time of making payment. In a country like China, the situation becomes a bit different. Although China as one of the developing countries compares to Malaysia, China has become one of the first e-wallet transaction streams to use mobile phones equipped with a Quick Response (QR) code to facilitate such transactions. As of the year 2016,

China's mobile payments amounted to $9 trillion, compared with $112 billion in the United States of America (Tan, 2018).

Besides that, over the next few years, digital banking in Malaysia is predicted to develop more rapidly as strong usage of internet, smartphones and tablets that allow banks to offer more service off-the-counter (Pikri, 2018). To date, digitisation within the Malaysian financial sector remains the key priority as the government aim to transform Malaysia into a cashless society, and Malaysia expected to become a cashless society in 20 years (Sharon, 2019). The creation of an integrated payment ecosystem as one of its Entry Point Projects (EPP) as stated in Malaysia's Economic Transformation Programme (ETP) are strives to achieve the vision of transforming the country into a high-income level country by the year 2020. The EPP targets to reduce dependence on cash transactions from 91 percent in 2013 to 63 percent of total transactions by 2020 (Bank Negara Malaysia, 2016a). However, there is a slight decrease of the percentage as from January to November 2018, the cash collected by automated teller machine (ATMs) dropped to 718.3 million, compared with 763.9 million for the year 2017 and 76.12 million for the year 2016 (FMT News, 2019).

Also, our government and Bank Negara Initiatives prepares nations for a cashless society by using cashless payment system (Albakri, 2017; Bernama, 2017; Chin, 2018; Sharon, 2019). For instance, in 2018, Malaysia's Multimedia and Communications Minister revealed that it is a need to reduce broadband charges while increasing its speed, as the government recognises that access to the internet is a basic human right in Malaysia. Thus, fixed broadband charges are expected to drop by up to 25 percent by the end of the year 2018 following the implementation of the "Mandatory Standard on Access Pricing" (MSAP) (Singh, 2018). Furthermore, in 2019, our Deputy

Prime Minister Datuk Seri Dr Wan Azizah Wan Ismail discovered that Malaysia is to have the wildest Internet access speed with the 5G platform in Southeast Asia via the Enhanced Malaysia International Internet Gateway (EM-IIG) High-Speed Broadband that is expected to be ready in 2022. The EM-IIG, which involved the installation of the optical fibre of 150 terabytes, would offer high-speed Internet access at low prices parallel to the government's preparation towards the Industrial Revolution 4.0 (Bernama, 2019b).

Additionally, Bank Negara Malaysia is also encouraging the switch from paper-based payments to electronic payments or e-payments to grow the performance of the payment systems in Malaysia (Pikri, 2019). To highlight the importance of e-payments, Financial Sector Blueprint 2011 to 2020 was introduced to drive this agenda forward and plans the future development of the financial system in the next ten years. Furthermore, in aiding the rise of digital banking in Malaysia, Financial Sector Blueprint for 2011 to 2020 target to increase the number e-payment transaction per capita from 54.4 in 2012 to 200 by the year of 2020 (Bank Negara Malaysia, 2016b). Bank Negara Malaysia initiated a 10-year electronic payment action plan in the year 2011, with total checks falling from 205 million in the year 2011 to 120 million in the year 2017. In contrast, electronic funds transfer was 66 million in the year 2011 and estimated at 329 million in 2017 (Surendra, 2017).

Also, the International Telecommunication Union (ITU) (2016) and The World Bank (2019) revealed that the number of mobile phone subscriptions among Malaysia had increased dramatically from 2005 and even exceeded the number of the population since 2008. In January 2017, there is a total of 42.93 million active mobile phone subscriptions, and the mobile penetration rate is high at about 139 percent in the

population (International Trade Administration, 2018). This represents that many individuals have multiple mobile subscriptions in the population. Additionally, there is almost 80 percent of them having a mobile broadband connection (We are Social, 2018; We Are Social, 2017). Besides, the accelerating development of 3G and 4G communication technologies, and now 5G or fifth-generation mobile technology (Kong, 2019), and the growing use of portable devices such as smartphones and tablets, all of these are bringing possible business opportunities not just for telecommunication industries but also financial industries as well (Yu, 2012).

In an increasingly competitive market, mobile banking can be seen as an attempt to add value by providing more convenience to customers (Mahad, Mohtar, & Othman, 2015). As outstanding services of banking sector playing an important role in supporting the growth of the economy in Malaysia. However, the growth of mobile banking is still slow within these ten years. Sooner or later, it is expected that this service will be used to stimulate slower economic activity in communities and slow increase of investment, leading to less employment and, potentially, slow-growing of incomes. Hence, its impact can be seen in terms of socio-economic disbenefits for individual users and the local community (Alampay, Moshi, Ghosh, Peralta, & Harshanti, 2017).

The evidence has shown that there is also a big gap between the internet and mobile banking's penetration rate every year. The statistics in Bank Negara Malaysia (2019b) indicated that the number of subscribers of mobile banking and the penetration rate of mobile banking is less than half of the population within these ten years. In 2018, the internet penetration rate had reached almost 80 percent of the population, but there are only approximately 14.4 million subscribers or 43.8 percent of mobile banking

penetration rate against the total population compare to the 29.5 million individuals or 91.1 percent of internet banking penetration rate of population. There are only slightly increased in mobile banking at 8.4 percent from 2017 to 2018 as shown in Figure 1.2 below.

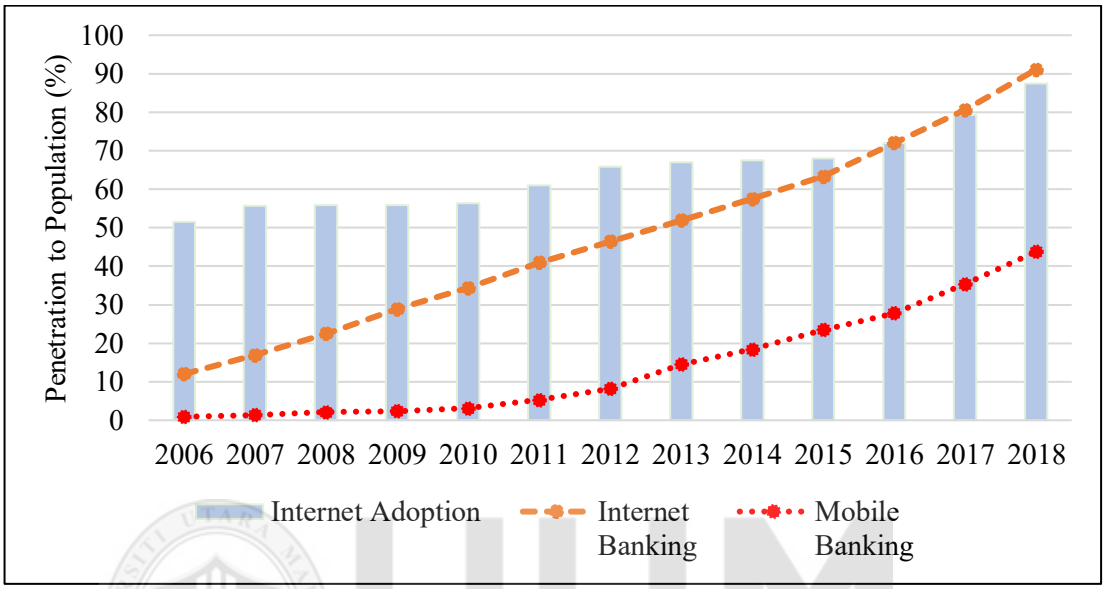


Figure 1. 2: The rate of Penetration for Internet Banking, Mobile Banking and Internet Adoption against Population in Malaysia
Source: Bank Negara Malaysia (2019b)

Mobile banking in Malaysia is considered relatively new technology which only offers limited services to the consumer; compared to internet banking that has been introduced to the consumer over a decade ago (DBS Group Research, 2015). The popularity of mobile banking was believed to continue to catch up with internet banking. But, mobile banking services in Malaysia still have a long way to go as most customers desire to conduct banking activities in conventional ways (Ashta, 2017).

To highlight the digital banking, Bank Negara Malaysia impose RM 0.50 processing fee per cheque which effective 2nd January 2015 and it will be progressively increased in future (Bank Negara Malaysia, 2014; PM Securities, 2015). More recently, the cheque fee would be increased from RM 0.50 to RM 1.00, start on January 2nd, 2021,

to indicate the higher processing cost (Surendra, 2017; The Star Online, 2017a). Compare to e-payment that can be performed via internet banking or mobile banking; the transaction fee is cheaper where it only charges at RM 0.10 compared to about RM 2.00 previously. With this, Bank Negara Malaysia also aims to reduce the number of cheques by more than half from 207 million to 100 million per year by 2020. In 2016, there was increased from 43.1 to 97.5 of e-payment transaction per capita from 2012 (Bank Negara Malaysia, 2016a). In the year of 2018, Bank Negara broadcasted that the transactions fee of instant bank transfer services has been waived effective 1st of July to inspire the direction towards the cashless society (Tariq, 2018).

Next, according to Bank Negara Malaysia (2017), internet banking can be conducted by using an internet-enabled computer, a web browser and a registered account. Whereas, mobile banking is almost the same as internet banking as it provides a quick and convenient way to conduct a common bank transaction. Mobile banking can be conducted by using a mobile phone that is equipped with the featured needed by the bank under the mobile telecommunication network coverage. It uses to link the user's bank account with his or her mobile phone. Also, mobile banking is a system and a channel that enables the customer of a financial institution to perform financial transactions by using a mobile device, namely a mobile phone or tablet (Gupta, 2015). Besides that, users also can access to financial and non-financial services like bill payment, funds transfer, PIN change, mobile balance recharge and account management anytime and anywhere (Bank Negara Malaysia, 2016b; Ensor & Wannemacher, 2012; Shaikh & Karjaluoto, 2014).

Moreover, the first Digital Free Trade Zone (DFTZ) where outside of China was successfully launched on 22nd March 2017 in Malaysia. DFTZ is expected to combine

physical and virtual areas with other online and digital services to promote international e-commerce and enable innovation based on the internet (The Star Online, 2017b). Additionally, the Finance Minister Senior Officer revealed that digital banking represents a potential growth for banking organisations as the increasing sophistication of banking transactions can be facilitated by the advancement of technologies (The Star Online, 2013; Yeong, 2013). For instance, Hong Leong Bank encourages the use of "Scan and Pay" in their mobile banking app to pay by using QR code, and the purchase amount will automatically deduct from a user bank account (Hong Leong Bank, 2017; MOLPay, 2016). Furthermore, at the end of the year 2017, Maybank launches their cashless mobile payment option using QR codes named "Maybank QRPay" (The Star Online, 2017c). This concept is e-wallet as it requires apps in a mobile device to load money and used to pay for goods and services as long as merchants accept that payment method (Jayaseelan, 2017; Vitex, 2017). In 2018, a total of 8.5 percent of total e-commerce purchases was paid by e-wallet in Malaysia compare to 64.1 percent in China. Also, in 2019, the e-wallet payment was expected to increase by 1.8 percent only (The Statistics Portal, 2019).

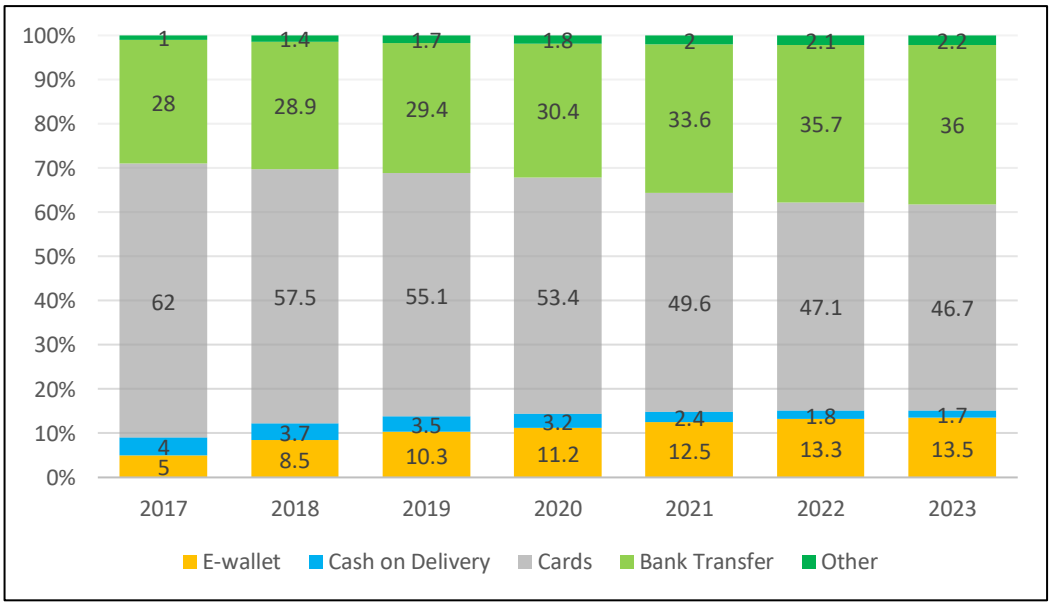


Figure 1. 3: Payment Types in Malaysia
Source: The Statistics Portal (2019a)

Since most Malaysians are likely to both mobile phones and debit cards on them, Bank Negara Malaysia plans to promote the use of Quick Response (QR) code payments (Surendra, 2017). For instance, recently, the QR code has been utilised in the payment system in many countries. One of the very successful cases happened in the People Republic of China. Back into the year 2011, Tencent Holdings Ltd. released the social media application "WeChat", it was clear that QR code had a lot more potential for their business. WeChat offered their users to use a QR code for exchanging contact information, paying for any products and/or services by its built-in wallet, or sending money through their application (Minter, 2017). Today, the AliPay of Alibaba Group and WeChatPay of Tencent are the two dominant payment applications for Chinese consumers, and it can be said that QR code is everywhere in China from the shopping mall, convenient stores to street vendors and even buskers and beggars (Wang, 2017). The recent figure shows that the total volume of QR code payment transaction is up to US$1.65 trillion in 2016, and that is approximately 30 percent of the total amount of mobile payment in China (Wang, 2017). In 2019, e-wallet was expected to contribute the highest percentage of the type of payment which is about 65 percent in China (The Statistics Portal, 2019).

Although the QR code payment applications are very successful in China, it is still very new for consumers in Malaysia. In China, according to the Ant Financial, an internet financial affiliate of Alibaba, the total of China's mobile payment users has gone above 520 million which is roughly 37.7 percent of China population (Xinhua, 2017). In Malaysia, according to Bank Negara Malaysia (2019b), the rate of Malaysia's population adopt to mobile banking still low. The lower rate of the adoption of mobile banking services may influence in QR code payments too, and it will be

caused the QR code payments not easily penetrate into a market (Kongarchapatara, 2018). Thus, there are opportunities for financial service providers to attract many more new customers in order to make their investment in this QR code application meet with success.

Currently, as cashless payments are still a small fraction of the country's total payments which about 20 percent, with only less than half of that payment is through e-wallet transaction. From the consumer point of view, the user can make a payment through the e-wallet instead of providing the cash or money to recipients. The e-wallet is essentially an application in a mobile device that can be reloaded with money and utilised to make payment for goods and services (Tan, 2018). While e-wallet consents users to pay for selected merchants by using their mobile phone. Purchases of items and payment of bills are available for cashless transactions (Bank Negara Malaysia, 2017b). E-wallet involves the activities of a business that using electronic devices connected to mobile networks for successful economic transaction solutions (Liébana-Cabanillas, Muñoz-Leiva, & Sánchez-Fernández, 2015). Therefore, the clear majority include fast, easy, secure, and convenient payment completion and transactions between the two parties, using e-wallet anytime, anywhere (Liebana-Cabanillas, Sanchez-Fernandez, & Munoz-Leiva, 2014; Nguyen & Huynh, 2018).

Similarly, e-wallet allows consumers to make use of mobile devices to make e-payments. As more and more users adopt different forms of mobile devices, new models of mobile business are continuously being unbolted and advanced. Given this demand, opportunities and prospects are large, and e-wallet has the opportunity to become the standard payment method in the future. The challenge lies in the execution, which creates value for consumers (Guhr, Loi, Wiegard, & Breitner, 2013). In detail,

the e-payment through the e-wallet is a brand-new technology has which will play a bigger role in daily consumer dealings. The Internet of Things (IoT) as stated in the Industry 4.0 framework, represent a part of this rapid evolution toward the financial institution of the future. Users and financial institutions need to familiarise to these retail and trend of mobile banking (Meola, 2016). Nevertheless, Malaysia is still one of the developing countries that have just embraced the cashless payment through the banking industry. Despite cashless payment consider as the easiest and convenient ways for consumers (Mahfuz, Khanam, & Hu, 2016) and provides enormous benefits for consumers (Gupta & Arora, 2017), however, Malaysia is still in the beginning stage to adopt the cashless payment, e-wallet (Tan, 2018).

Even though the e-wallet bring a lot of benefits for financial institutions to retain their customers and reduce the cost of operation, simultaneously it also added value for their consumers to carry out their banking transaction anytime and anywhere as mobile devices are easy to turn on and easy to carry (Koksal, 2016; Laukkanen, 2007; MCMC, 2018; Smutkupt, Krairit, & Esichaikul, 2010). However, the key question is why customers are not adopting e-wallet via QR code? As consumers demand a personalised and highly flexible system experience but decreasing e-payment costs, e-wallet is probably to provide consumers with fast, secure and affordable access, storage and remittance methods via the Internet (Courbe, 2016).

In Malaysia, there are around 37 percent of population are categories under millennial generation where it is between the age of 22 to 37 in the year 2018 and 23 to 38 in the year 2019 (Pew Research Center, 2018, 2019; PwC, 2012b), and it contributes the largest segment of the population compared to other generations as shown in Figure 1.4 (Department of Statistics, 2019). Besides that, in this generation, there are

approximately 60 percent are handphone users (MCMC, 2014; Tan, Chong, Loh, & Lin, 2010). Millennials are seen as active users of mobile technology devices, and millennials have been a profitable market segment for financial institutions offering innovative products and services. They are more likely to try new or innovative products or services. Therefore, understanding the millennial innovation needs is very important for financial institutions to attract them to use e-wallet services (Debasish & Dey, 2015; Efma and Oracle Financial Services, 2010; Valentine, 2014).

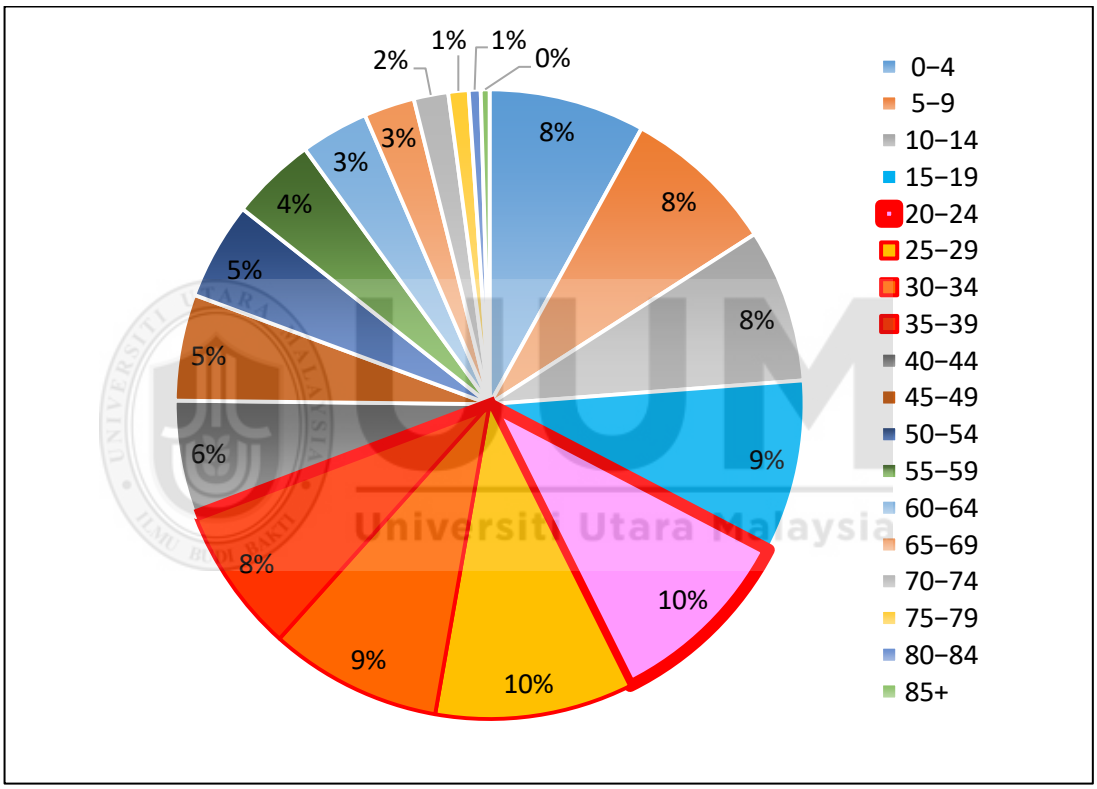


Figure 1. 4: The 2018 population by age group in Malaysia
Source: Department of Statistics (2019)

On a global scale, the middle class is expected to rise by 180 percent between 2010 and 2040. Undeniable that middle class of Asia region is bigger than Europe Region. By the year 2020, most of the population is considered a "middle class" and is probably to move from North America and Europe to the Asia Pacific region, as shown in Table 1.1 below. In the next 30 years, approximately 1.8 billion people will migrate to the city, mainly in the Africa region and Asia region, forming the utmost vital new

prospects for financial organisations. The growing middle class tends to drive higher usage, with mobile devices. Asia-Pacific countries with major middle-class growth in the world will also get the greatest demand for technological driven innovation (Courbe, 2016).

Table 1. 1
Global Middle Class Statistics – Population in Millions

Region	2009 (%)	2020 (%)	2030 (%)
North America	18	10	7
Europe	36	22	14
Central and South America	10	8	6
Asia Pacific	28	54	66
Sub-Saharan Africa	2	2	2
Middle East and North Africa	6	5	5
World	**100**	**100**	**100**

Source: PwC (2016)

Malaysia desires a solid and mounting group of the middle class or middle 40 percent (M40) to promote the country's advanced economic status by the year 2020. M40 is very significant to the country's well-being because it is a consumer spending and core private investment country (Malaysian Trades Union Congress, 2015). For the M40 households, the majority of the proportion of household incomes from paid employment has steadily decreased over the past three Household Income and Basic Amenities Survey periods as shown in Figure 1.5. Also, the M40 households have seen their share of current transfers in household incomes rise over the past three Household Income and Basic Amenities Survey periods (Khazanah Research Institute, 2016).

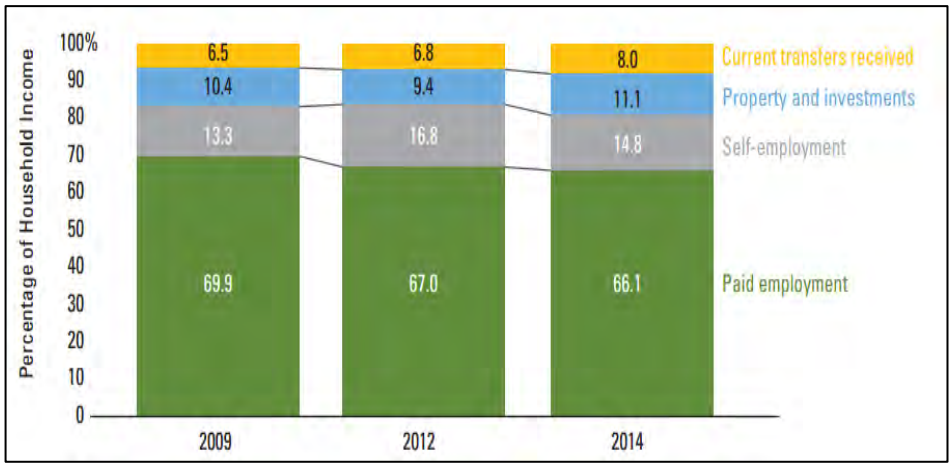


Figure 1. 5: Sources of household income for M40 households in Malaysia
Source: Khazanah Research Institute (2016), p.19

Likewise, the success or the failure of e-wallet depends heavily on consumer technology readiness and their acceptance (Guhr *et al.*, 2013). The fundamental obstacle is the behaviour of consumers, who require some critical capability to adjust to yet another innovation (Sumathy & KP, 2017). Consumers differ in terms of technological interactions and cultural differences. This can affect the ability of consumers to receive and use IT. Today, this impact can also affect mobile services such as e-wallet. While some consumers may see e-wallet with higher interest, other consumers may be more worried. These differences can make a variance between the success and failure of mobile system implementation (Guhr *et al.*, 2013).

As the e-wallet is the latest technological development (Changchun *et al.*, 2017), and it shows an outstanding perspective to the banking industry with the increase of mobile phones users and internet users in Malaysia. It is important to identify the acceptance or rejection of new technology as this identification will be the most challenging issues under the perspective of IT and IS (Blauw & Franses, 2011). Financial institutions need to understand the reason for their customers to accept the e-wallet. But, attracting

new users may also not be easy (Liang, 2016). Hence, it is necessary to understand the determinants that contribute to an individual's intention towards using an e-wallet.

Therefore, the uniqueness of this study lies in its aim to examine the determinants that manipulating the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. This study intends to deliver insight by providing an analysis of the acceptance of e-wallet transaction via QR code to the researchers and practitioners. The results of this research will benefit the banking organisation to build meaningful relationships with consumers while reducing the concerns and fear of non-adopters. It drives to increase the marketing efforts for e-wallet by understanding the aspects that affect the use of e-wallet practices.

1.2 Problem Statement

Since 1987, Malaysia has been classified as a low middle-income country for the first five years and upper-middle-income in the following twenty-seven years. As Malaysia heads towards the high-income country horizon, the country would need to reflect on its state of development and key challenges it faces to become an advanced economy (Khazanah Research Institute, 2018; Lim, Yusuf, & Suanda, 2017). Banking industry begins to use to the technology since 1960, and they still experience the changes in technologies in the management of banking information from time to time (Kishore & Sequeira, 2016). Traditionally, there is a large number of banking services can be obtained from the bank branches located near to customers. Nevertheless, this traditional channel has started to be substituted by digital channel (Hajare, Mahajan, Jadhav, Pingale, & Salunke, 2018; Newman, 2019).

Furthermore, the increasing use of smartphones and cashless communities will increase the growth of space of e-wallet (Yai, 2018). But, currently, the habit of paying in cash is the biggest obstacle for the development of e–payments (Bernama, 2019a; Nguyen & Huynh, 2018). Analysts discovered that part of the motive for cashless, especially e-wallet, has become so great in China because this country is one of the world's top mobile phone users (Tan, 2018). However, compare to the situation in Malaysia, although there are an enormous number of mobile phone subscriptions that had to exceed the number of population in Malaysia (International Telecommunication Union (ITU), 2016; MCMC, 2018; The World Bank, 2019; We are Social, 2018), but, e-wallet accounts for only a minor portion of the country's total payment transaction (Tan, 2018; The Statistics Portal, 2019). This circumstance implying that the adoption of an e-wallet is still unfamiliar for consumers and there is the potential of rejection to adopt this advanced technology. Thus, it is interesting that although QR code in e-wallet has high potential and capability for marketing communication; however, most consumers still are not interested much in participating with it. This issue has drawn attention from the researcher to identify and understand the factors that drive individuals' behavioural intention to use this e-wallet thought QR code transactions in Malaysia.

Moreover, due to the potential of commerce of mobile, it has attracted great attention from academics to explore the behavioural intentions of using e-wallets among Malaysian consumers. The relationship between individual perception and behavioural intention to use e-wallet is less documented. Further, limited studies are being done on consumers' behavioural intention to use e-wallet transaction via QR code, especially in Malaysia context. There are only quite a few local studies aim to examine the

behavioural intentions of using digital banking (Amin, 2008; Amin, Rahim Abdul Rahman, Laison Sondoh, & Magdalene Chooi Hwa, 2011; Amin, Supinah, Aris, & Baba, 2012; Cheah, Teo, Sim, Oon, & Tan, 2011; Krishanan, Khin, Low, & Teng, 2015; Shanmugam, Savarimuthu, & Wen, 2014; Tan & Lau, 2016). Since the consumer's behaviour acts as the main predictors to stimulate the adoption of technology (H.-F. Lin, 2011; Shaikh & Karjaluoto, 2014), but there is lacking literature that examines the behavioural intention in adopting e-wallet transaction via QR code in Malaysia especially among the M40 millennials. Yet, there has been significant interest in behavioural intention to use e-wallet in Malaysia in recent years.

To a large extent, the age of consumers in the adoption of technology have been observed in past studies (Lee & Coughlin, 2015), and the students of the college as respondents have been the subject of most of the researches too. Students participate in many context such as mobile banking research (Tan & Lau, 2016), entrepreneurial (Lim *et al*., 2017), online shopping (Bilgihan, 2016), health (Cho, Quinlan, Park, & Noh, 2014; Deng, Mo, & Liu, 2014), fashion (Hur, Lee, & Choo, 2017), social media (Leung, 2013) and photo and notes sharing (Ding & Chai, 2015) have been investigated. Not surprisingly, examination in the M40 Millennium cohort is rare, especially in the area of e-wallets. Besides that, previous studies included respondents from other generations (Leon, 2018). Therefore, past research is not a special focus on the M40 millennial generation. The Millennials in the research of e-wallet have not been thoroughly studied and cannot fully understand the intention of their behaviour to use technology.

On the other side, from a critical literature review, there is a lack of previous studies have investigated the e-wallet (Mahapatra & Patra, 2016). Also, the literature of

information systems (IS) is filled up with a large number of theoretical models, and most of the prior studies have tried to identify the determinants that influence behavioural intention to use digital banking through traditional adoption models which including Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), Technology Acceptance Model (TAM) (Davis, 1986; Davis, Bagozzi, & Warshaw, 1989), Theory of Planned Behaviour (TPB) (Fishbein & Ajzen, 1975), and Diffusion of Innovation (DOI) (Rogers, 1983) from different countries (Abadi, Ranjbarian, & Zade, 2012; Aboelmaged & Gebba, 2013; Alalwan, Dwivedi, Rana, & Williams, 2016; Gupta, Manrai, & Goel, 2019; Hosseini, Fatemifar, & Rahimzadeh, 2015; Owusu Kwateng, Osei Atiemo, & Appiah, 2019; Sharma, 2017; Shaw & Sergueeva, 2019; Singh & Srivastava, 2018; Sinha, Majra, Hutchins, & Saxena, 2018). However, there is a generally a lack of strong empirical work to create a model that can be used to identify the determinants that can clarify the behavioural intention to use an e-wallet.

Furthermore, according to the previous local studies, other than the study from Tan and Lau (2016), and Rahi, Ghani, Alnaser and Ngah (2018), all other studies are investigating through TRA, TAM, TPB and DOI, and its extension as well as the theoretical bases. In reality, the majority of studies of digital banking depend strongly on TAM and rarely make use of other approaches which included the Unified Theory of Acceptance and Use of Technology (UTAUT) (Williams, Rana, & Dwived, 2015) and Technology Readiness Index (TRI) (El Alfy, Gómez, & Ivanov, 2017). Despite that, Venkatesh, Viswanath., Thong, James and Xu (2012) invite researchers to expand the nomological network related to online self-service acceptance by integrating other core concepts into the original UTAUT model.

Besides that, in the past two decades, there is a huge number of studies have focused on identifying various determinants that stimulus the user acceptance behaviour, strengthening some theoretical models. While, a review of more recent studies suggests extant works need to focus on combining several theoretical models as their factors to influence end customer's behavioural intention to use advanced IT, including e-wallet. It is important as a more comprehensive view transcending existing models is required to be developed (Afshan & Sharif, 2016; Oliveira, Faria, Thomas, & Popovic, 2014). More specifically, as UTAUT used to examine the acceptance of technology, however, by a focus only on the features of the perception based on UTAUT is not enough (Afshan & Sharif, 2016). Celik (2016) argued that UTAUT has already reached its limits in terms of explaining the focal behaviour.

In contrast, when traversing the literature, Boon-itt (2015) argued that technology readiness (TR) of the consumer is the driver that can enhance service quality of self-service technology (SST). In the present mobile world, despite the high potential of e-wallets, the existence of such services does not mean that the market is ready for them (Guhr *et al*., 2013; Sinha *et al*., 2018). Although users are becoming more and more complex with SST, simultaneously, some consumers are avoiding new technologies such as e-wallet, while some of them feel frustrated dealing with such advance technology (Lin & Hsieh, 2012). Therefore, with the support from more recent literature, it is necessary to understand the readiness of individual to embrace and use cutting-edge technologies as it is important to shape the individual's perception (Parasuraman & Colby, 2015; Sinha *et al*., 2018; Zhou, 2011) and the behavioural intention to use e-wallet (Oliveira *et al*., 2014).

Follow Hofstede's cultural index scores, Malaysia is scored from medium to low levels of uncertainty avoidance (Belkhamza & Azizi Wafa, 2014; Hofstede Insights, 2019). Consumers who are optimism and innovativeness love the idea of using an e-wallet; however, some consumers also perceive less comfortable and insecurity with storing cash on their mobile phones or using e-wallet for highly personal items (Bothun, Glisson, Haas, Issac, & Lieberman, 2013). As the inevitability of e-wallet is facing such dispute on positive and negative belief in new technology, thus, this study aims to understand the consumer's general belief through Technology Readiness Index (TRI). Even in the location of neighbouring Singapore, which are considered the most advanced technology, cash is still the choice of reimbursing for goods and services. Like other parts of Southeast Asia, Malaysia's high-tech payment are relatively slow (Tan, 2018).

Furthermore, "consumers still rely on traditional payments today" (Accenture, 2016, p.2). Optimism in consumers has not crowned a digital payments leader, even though they trust traditional providers the most. The optimism of consumers expects financial institutions to secure their money, protect their information, and prevent and safeguard against fraud. In this landscape, payments experiences must go beyond transactions to make emotional connections with consumers. This requires understanding how consumers think about money and innovating to deliver on expectations. That is what it takes to shape the market rather than be shaped by it (Accenture, 2016). Yet, there is a gap in understanding how this positive readiness, namely optimism, translate their personality trait into behavioural intention to use technology.

Besides that, knowledge of motivators and inhibitors of advanced technology is required to investigated (Kishore & Sequeira, 2016). An individual with

innovativeness is willing to take the risk to be an active explorer of searching for something new and able to deal with uncertainty conditions of technology (Seol *et al*., 2017; Sinha *et al*., 2018; Thakur & Srivastava, 2014). Also, although users are getting complicated in the technological interaction perspective, they may block certain SST if they are lack of innovativeness and feel uncomfortable and unsafe, although the benefits including ease of use and performance usefulness are obvious in the technology (Lin & Hsieh, 2012). Thus, it is a doubt to understand the positive technology beliefs and feeling, which will assist financial institutions to improve their e-wallet further as the M40 millennials are the potential market segment in Malaysia.

Additionally, consumers have some discomfort and fears about this new technology replacing what is familiar to them (MCMC, 2018). Consumers might be holding back from using e-wallet due to the security, privacy and ability to use issues. If the phone is lost, stolen or compromised, consumers may be concerned about their responsibilities and express concern that if they become an active e-wallet user, their smartphone will become a bigger target of theft. Customers typically make payment for goods using prepaid cards, debit cards or credit cards on the market. Many prepaid cards issued by some stores are not recognised when they disappear. Besides, someone who picks up a lost prepaid card able utilises it without being identified by enforcement agency (Chang, 2014). This feeling of discomfort toward technology may reduce the behavioural intention to use technology in one country. However, to date, there are no clear studies about this relationship in the prior studies, especially in the context of e-wallet in Malaysia.

Nowadays, Malaysia's mobile commerce is growing. Mobile network operators have increased, and commercial banks have started to provide digital banking services. But,

the industry is now facing some challenges, including insecurity levels and technological advances (International Trade Administration, 2018; MCMC, 2018). In facts, the spending habits of Malaysians prefer to use cash for payments (Bernama, 2019a; Sharon, 2019). Total of 75 percent of Malaysians believes that the mobile payment option is unsafe and risky. While many people like to go shopping online or shop by their mobile phones, they hesitate. The main reason for reluctance in accepting monetary equipment is the lack of security (Henry, 2018). Thus, the feeling of insecurity of e-wallet may pose some challenges in the behavioural intention to use the technology.

Besides that, Malaysia still trapped in Industry 2.0 currently. Although Malaysia was one of the leading industrial countries back then, most of the neighbouring countries and beyond already built the links from industry 3.0 to industry 4.0 (Leong & Kasmuri, 2017). As moving forward, financial institutions are turning toward new IoT technologies in Industry 4.0 to enhance the performance of technology, user experience and reduce costs (Meola, 2016). However, the challenge for financial organisations now is to put in place on the performance expectancy of technology, where a flexible and robust business model that is relevant and efficient with the changing landscape of banking technologies. Bank Negara Malaysia (2016) also highlighted in the Financial Stability and Payment System Report 2015 about the extra efforts are needed to guarantee the improvement of convenience, flexibility and security measure of digital banking. In the current mobile world, mobile payment services have great potential, but the simple presence of the services does not mean that they have the intention to use, or there is the readiness of the market is high for

them. Services of mobile payment necessity to add more value to attract more new users (Bao, 2018; Guhr *et al*., 2013).

Next, effort expectancy affecting behavioural intention to use technology has always caught the attention of researchers (Cimperman *et al*., 2016; Khalilzadeh *et al*., 2017; Rana *et al*., 2016; Thongsri *et al*., 2018). As an advanced technology, e-wallet is likely to aid consumers to become easier and create more effort expectancy for an individual through financial services and provide a platform for banks or non-bank entities to improve their business performance (Singh, Srivastava, & Sinha, 2017). However, consumers still choose to use cash or bank cards in Malaysia, and local banking institution sense that there is a "limited in success" in encouraging a cashless revolution as e-wallet is the extended family of mobile banking (MobileAPPtelligence, 2015; Moser, 2015; Tan, 2018; Vitex, 2017).

Although the world's first DFTZ outside China was launched in Malaysia, but "it's clear at the moment that Malaysian consumers are a bit less willing to move to these (digital) channels for their banking" (Raj, 2014, p.27). This implies that the improvement of the procedure in bank transaction is one of the main concern to create a computerised operation medium for consumers (Daud *et al*., 2011; MCMC, 2018). Therefore, Ha, Chung, Hamilton and Park (2010) illustrated there is an important issue to explore the behaviour intention of consumers in the adoption of advanced technology as it will influence the success or failure of the particular product or service (Bauer, Reichardt, Barnes, & Neumann, 2005; Cuong, Linh, & Ha, 2015).

In fact, in Malaysia, the government is striving to improve the facilitating conditions to transform Malaysia into the cashless society. This effort was expected to enhance

the facilitating conditions to use e-wallet as the broadband prices were reduced by the end of the year 2018, and this was expected that people from all sectors and different income groups have access to the internet and are given the opportunity to participate fully and benefit from the digital era (Bernama, 2019b; Singh, 2018). However, this creates a question that, even this kind of facilitating condition was created, but are they willing to move to these digital channels?

Additionally, the adoption of e-wallet in Malaysia is not on the desired level, and consumers are still sluggish in accepting this advanced technology, as shown in Figure 1.3. Evident in Figure 1.2 stated that the penetration rate of mobile banking in Malaysia remaining low from the year 2006 to 2018 (Bank Negara Malaysia, 2019). Hence, it is a concern regarding the low adoption rate of mobile banking in Malaysia, as well as the feasibility of introducing QR code in the e-wallet channel as Malaysia has provided a lot of resources for this matter. Besides that, QR codes can be found in-store marketing literature, signage and store stores. These are allowing users to quickly and easily access brand-related content or payments (Perry, Kent, & Bonetti, 2018). However, these facilitating condition and the validity of the QR code in the store depends on whether the behavioural intention of the user to use it.

Moreover, even though e-wallet is a growing activity, however, in one culture's society, because of its social influence (Ghezzi, Renga, Balocco, & Pescetto, 2010; Guo, Zhao, Jin, & Zhang, 2010; Manvi, Bhajantri, & Vijayakumar, 2009), it will create a degree of social acceptance, thanks to the mobile phone's widespread use (Liebana-Cabanillas *et al*., 2014). In fact, convincing users to change their behaviour rather than using traditional banking channels for e-wallets is an uphill task, particularly if there is an absence of considerate of the situation from the user's perspective (Alalwan *et al*.,

2016). Consequently, it can be argued that the main challenge for the success of e-wallet is to persuade and convince consumers to adopt it as a full alternative to traditional channels (Alalwan, Dwivedi, & Rana, 2017; Laukkanen, Sinkkonen, Kivijärvi, & Laukkanen, 2007; Mahapatra & Patra, 2016). Thus, understanding in individual technology readiness of consumer is critical for digital banking service providers (Zhou, 2012b), where they need to deal with the slow diffusion of e-wallet in the country (Chiu, Bool, & Chiu, 2017; Tan, 2018).

In sum, although a large number of digital banking research relies heavily on TAM, other methods such as UTAUT are rarely used (Williams *et al*., 2015), but, prior studies have overlooked the role consumers' technology readiness (TR) (Seol, Ko, & Yeo, 2017) in the intention to use e-wallet technology among M40 millennials. Therefore, the researcher tends to bridge this gap by advance the existing body of knowledge by providing an inclusive framework that tries to discover the extent to which consumers are prepared to use e-wallet transaction via QR code, and the role of perceptions are in shaping the behavioural intentions to use e-wallet M40 millennials. Thus, this study aims to integrate the determinants from the frameworks of UTAUT and TRI to investigate the behavioural intentions to use e-wallet transaction via QR code among M40 millennials in Malaysia. Consequently, because of the potential of the e-wallet adoption, it has attracted many scholars to investigate the determinants that might be responsible for the sluggish acceptance of e-wallet to assist financial organisations in accelerating the adoption of this technology.

1.2 Research Questions

In this study, there are research questions that have been developed to respond to the problem statement. To address the issues highlighted, the following research questions are:

i. Which variables (optimism, innovativeness, discomfort, insecurity performance expectancy and effort expectancy,) influence the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia?

ii. Which variables (optimism, innovativeness, discomfort, insecurity) influence the performance expectancy of e-wallet transaction via QR code among M40 millennials in Malaysia?

iii. Does optimism, innovativeness, discomfort, insecurity have a significant influence on the effort expectancy of e-wallet transaction via QR code among M40 millennials in Malaysia?

iv. Does performance expectancy and effort expectancy mediate the relationship between, optimism, innovativeness, discomfort, insecurity, and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia?

v. Does facilitating conditions and social influence moderate the relationship between optimism, innovativeness, discomfort, insecurity, and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia?

1.3 Objectives of Study

The primary objective of this paper is to integrate the determinants in two technological models to explain M40 millennials' behavioural intentions to use e-wallet transaction via QR code. The research objective is as follows:

i. To investigate whether optimism, innovativeness, discomfort, insecurity effort expectancy and performance expectancy, that influence the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.

ii. To investigate whether optimism, innovativeness, discomfort and insecurity influence the performance expectancy of e-wallet transaction via QR code among M40 millennials in Malaysia.

iii. To examine whether optimism, innovativeness, discomfort and insecurity influence the effort expectancy of e-wallet transaction via QR code among M40 millennials in Malaysia.

iv. To investigate whether performance expectancy and effort expectancy mediates the relationship between optimism, innovativeness, discomfort, insecurity, and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.

v. To examine whether facilitating conditions and social influence moderate the relationship between optimism, innovativeness, discomfort, insecurity, and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.

1.4 Scope of the Study

This study aims to have a deep understanding of the determinants that affect the behaviour of individual intention to use the e-wallet transaction via QR code among M40 millennials in Malaysia. This study attempts to understand the importance and the relationship between determinants in consumer's general beliefs by using technology readiness index (TRI) and the individual's perception toward the behavioural intention by using the Unified Theory of Acceptance and Use Technology model (UTAUT).

In the present day, mobile technology has become a necessity, rather than just being a tool for communication. Thus, the acceptance of mobile technologies can be considered from a cognitive behavioural perspective, and as mentioned previously, the key objective of the current study is to investigate the determinants that will influence the potential M40 millennials' intentions to use the e-wallet transaction via QR code in Malaysia. To predict the determinants of IT acceptance, the combination of several the determinants from different theoretical models is needed (Afshan & Sharif, 2016; Oliveira *et al*., 2014).

This research is based on existing technology's theoretical models to combine two models, namely UTAUT (Venkatesh *et al*., 2003) and TRI (Parasuraman, 2000a) by linking the various factors in theoretical models. Additionally, performance expectancy and effort expectancy was used as the mediating variables to investigate the relationship between those connecting variables. Besides that, facilitating conditions and social influence were utilised as moderating variables in this study. In specific, the current study focuses on the factors that promote or hinder the behavioural

intention to use e-wallet transaction via QR code among potential M40 millennials in Malaysia.

Next, the key respondents of this study are the M40 millennials in Malaysia. To gather data, total one thousand and four hundred of self-administrated questionnaires are randomly targeted to respondents among the participant in Malaysia. Individuals who are born in the year 1981 to 1996 and having the households that earned between RM 4,360 and RM 9,619 per month are the target respondents in this study. Also, a participant who owns a mobile phone and bank account but does not use e-wallet transaction via QR code will be the sampling population of this study as this study focuses on potential e-wallet among M40 millennials. Additionally, this study also attempts to test the proposed model by using Structural Equation Modelling (SEM) based on Partial Least Square (PLS) as the method of analysis.

1.5 Significance of Study

This study provides clarification and understanding of the M40 millennials' acceptance of e-wallet transaction via QR code in several ways. Instead of just concentrating on the one established theoretical framework, this study provides an all-inclusive method by integrating two established theories of technology acceptance.

Throughout the study, there is a lack of detailed study on the behavioural intention to use e-wallet transaction via QR code in Malaysia were found. Therefore, this research provides the basis and act as a reference for future researchers. The proposed model that improved from the existing model by integrated the determinants from TRI and UTAUT to contribute to predicting the individual bases behavioural intention to use the e-wallet transaction via QR code in Malaysia. Moreover, performance expectancy

and effort expectancy also test as the mediating variables in this study. Besides that, facilitating conditions and social influence will be tested as moderating variables in the current study. Therefore, this study makes a significant contribution to the body of knowledge theoretically, practically and methodologically.

From the theoretical perspectives, this study explains the complexity of the proposed model and provide the more explicit role of the model to examining the behaviour intention of M40 millennials' consumers toward the acceptance of e-wallet transaction via QR code. The existing literature on e-wallet stressed very much on the perception aspects of technology, and scarcely of studies investigate the influence of the individual intrinsic characteristics including technology readiness in the past studies (Oliveira *et al*., 2014; Parasuraman, 2000a). Thus, this study contributes to generating a comprehensive model that could better explain M40 millennials' behavioural intention to use e-wallet transaction via QR code.

This study also contributes to the existing literature of behavioural intention to use technology with the development of a new inclusive paradigm of two technology model in studying an individual's behavioural intention. The theoretical contribution of this study will serve as a practical guideline for researchers to enrich their future study. Therefore, the study also provides academics and researchers with up-to-date information on the behavioural intention to use the e-wallet transaction via QR code in the banking industry. Also, it helps to understand and improve the literature on factors related to the intent to use new technologies by raising the expectation of time as a research intermediary.

From the view of practical perspective, the finding of this study will reveal the latest information and deep understanding for financial organisations to develop the most relevant strategies to capture the market as this study examines the determinants of behavioural intention to use e-wallet transaction via QR code. This is because, with the impact of Industry 4.0, the banking industry faces a competitive threat from two technology-driven companies. The first group is major technology companies such as WeChat, Alibaba Group Holdings Ltd. and Apple, and another group of new financial technology (Fintech) corporations. These giant companies use the loyalty and reputation of their core products, such as smartphones, technology tools and social media platforms to infiltrate and disrupt the supply of traditional banking products. Instead, new and frequently operated financial technology operators operate at lower operating costs and lack of regulatory burden, providing different and easy value propositions for solving traditional financial problems, while traditional banks require long-term processes and documentation procedures (Sultan, 2018).

Also, from this research, financial organisations could have more understanding towards the readiness of consumers to use the e-wallet transaction via QR code, which will lead to more productivity of marketing strategy plans and reduce the unnecessary waste of resources of their financial institution. As the major hindrance in the e-wallet transaction via QR code adoption is the safety and privacy concerns (Afshan & Sharif, 2016), this study will provide more understanding toward the M40 millennials consumer's beliefs, and financial institutions need to take into account these issues from the early phases and ensure that each customer trusts the business agencies and the ethical quality of the financial institution. Moreover, the results of this study will be helpful to financial institutions in developing plans to diminish the level of

uncertainty associated with the e-wallet transaction via QR code and establish trusts of an individual within a country which the residents are having diversified cultures, ethnic backgrounds and languages.

In methodological contribution, this study contributes by combining nine variables in a proposed framework, and Structural Equation Modelling (SEM) based on Partial Least Square (PLS) will be applied to analyse the complex relationships from the obtained data. The measurement indicators used in the current study were adapted from various sources and different contexts; their revalidation in the context of e-wallet transaction via QR code bears a methodological contribution. Similarly, the use of PLS path modelling, a robust, second-generation structural equation system will provide a platform for comparison between the covariance-based SEM and PLS-SEM.

1.6 Definition of Key Terms

This section briefly describes important key terms of the study. The key terms show the variable definitions and assist in understanding the concept within the context of the study. The following are the definitions of key terms:

1.6.1 E-wallet Transaction via QR Code

E-wallet is an application on the mobile phone, and it also scans the merchant's QR code for e-payments to be made. E-wallet is working with consumer's existing savings and current account (Wong, 2018).

1.6.2 M40 Millennials

M40 millennials are born in the years 1981 to 1996 (Pew Research Center, 2018), and households that earned between RM 4,360 and RM 9,619 per month (Khazanah Research Institute, 2018).

1.6.3 Behavioural intention to use e-wallet transaction via QR Code

The strength of a person's intention to accept the e-wallet transaction via the QR code in the future (Venkatesh *et al*., 2012).

1.6.4 Optimism

The degree to which individuals believe that e-wallet transaction via QR code will increase control, flexibility, and efficiency in life (Parasuraman & Colby, 2015). It generally captures positive feelings about technology.

1.6.5 Innovativeness

The extent to which people through the pioneer and QR code thinking, the individual thinks he will become the level of the wallet transaction (Parasuraman & Colby, 2015). This is usually the step by which the individual perceives themselves as being at the forefront of technology acceptance.

1.6.6 Discomfort

The extent to which an individual believes that he or she will lack control over e-wallet transaction via a QR code which makes them reluctant to use e-wallet transaction via QR code (Parasuraman & Colby, 2015). It generally measures the fear and concerns people experience when confronted with technology.

1.6.7 Insecurity

The extent to which an individual believes that the doubts about the e-wallet transaction via QR code's capability to operate appropriately and matters about its hypothetically destructive outcomes which will negatively affect their readiness (Parasuraman & Colby, 2015). This aims on concerns people may have in the countenance of technology-based transactions.

1.6.8 Performance Expectancy

The extent to which people think that transaction of e-wallet via QR code will help to accomplish the task better (Venkatesh *et al*., 2012).

1.6.9 Effort expectancy

The extent to which people believe who use e-wallet transaction via the QR code will be free and easy to handle (Venkatesh *et al*., 2012).

1.6.10 Facilitating condition

The extent to which people believes that an organisational and technical infrastructure exists to support the use of e-wallet transaction via QR code (Venkatesh *et al*., 2012).

1.6.11 Social Influence

The extent with which people who are important to him or her will influence the person to accept e-wallet transaction via QR code (Venkatesh *et al*., 2012).

1.6.12 Technology Readiness Index (TRI)

TRI was established to examine people's general beliefs about technology. TRI also measures personality traits of individuals and the readiness of an individual to use of technology (Parasuraman & Colby, 2015).

1.6.13 Unified Theory of Acceptance and Use of Technology (UTAUT)

The UTAUT was developed to investigate the perception of individuals regarding the degree of acceptance of technology (Venkatesh *et al*., 2003).

1.2 Organisation of Chapters

This study is organised into five chapters. The first chapter discusses the background of the study, research problem, research questions, research objectives, the scope of the study, significant of the study, the definition of the key term and overall structure of five chapters in this research. The literature review in chapter two presents the underpinning theories which including UTAUT, and TRI, critical review of the existing related studies, research framework and hypotheses development. Next, chapter three discusses the research methodology, which including research design, the sample used, questionnaire instrument, data gathering, and data analysis. Meanwhile, the finding of the data analysis is to report and discuss in chapter four. `The last chapter of this research will present the discussion and summary of the result, implication, recommendation of future research and conclusion.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter aims to develop a clear understanding of literature and the key elements that influence the behavioural intention to use e-wallet transaction via QR code. This chapter also focuses on the critical literature review of the Unified Theory of Acceptance and Use of Technology (UTAUT) and Technology Readiness Index (TRI). Moreover, this chapter attempts to provide a clear and in-depth insight on the relationship between determinants by giving the extensive critical literature review in the field of technology acceptance, and the relationships between variables will be established. Last, the theoretical framework and hypothesis are also explained in this chapter.

2.2 E-Wallet

With the rapid-developing technology in the world today, there are several innovative payment options introduced to customers. Rather than spending by cash only, customers have alternatives to pay for their shopping by credit card, internet banking, mobile banking, and e-wallet (Kongarchapatara, 2018; Sharon, 2019). Cash is no longer the king. The banking industry has seen the technological revolution in foreign banks, the private sector and the public sector. The revolution of technology has made banking easier and more reachable. Although banking institutions are hard to set up their online banking products; but, now, mobile banking has become new technology.

Today, in the digital payment revolution, the company of wallet is actively contacting retailers to enable customers to use e-payments through e-wallet (Mahapatra & Patra, 2016).

An e-wallet is a digital account that matches a physical wallet. In traditional terminology, "wallet" refers to a wallet or folding case to securely deposit money (Hart, 2019). E-wallet technology also commonly referred to as "mobile wallet" and "digital wallet" technology, allows users to present a mobile device at point of sale (POS) payment equipment to conduct a transaction at a brick-and-mortar merchant location using a payment card. The user can make online payments via their e-wallet (Jones, 2017). Mahapatra and Patra (2016) state that there are different types of e-wallet introduce by the companies which including Bank Sponsored Wallets, Third-Party Wallet, E-commerce wallets, and Mobile Operators Wallets.

E-wallet is an Internet-based electronic payment system that stores financial value and personally identifiable information. This e-payment system enables customers to use the integrated hardware and software systems to pay for goods and services online, including transferring funds to others (Koch & Siering, 2017). The hardware used will be a mobile phone. Communication between the buyers and the sellers can be done via the internet on the mobile network. Therefore, e-wallet is an online money account that does not need the use of physical cards for undertaking transactions. Dissimilar from savings bank accounts, e-wallet currently does not offer interest in saving money. In short, e-wallet is an integral part of the payment system. E-wallet is working with consumer's existing savings and current account. E-wallet is an application on the mobile phone, and it also scans the merchant's QR code for e-payments to be made (Wong, 2018).

Besides, nowadays, mobile devices are playing many roles. As the processing power and memory of mobile devices have increased, consumers have been able to handle more challenging applications. In addition, due to the high adoption rate and portability of mobile devices, consumers are becoming the one common element for people, who carry these devices with them everywhere. Such mobile devices are replacing the functionality of landline telephones, address books, personal organisers, personal computers, photo cameras, radios, and so on. In some cases, such mobile devices are even replacing much of the functionality of wallets and are being used as a means for carrying out banking (Machani, 2016).

The mobile phone can act as a new wallet for the consumer. Consumers can enjoy payment on-the-go and discover attractive deals and promotions right at the consumer's fingertips. It is very easy, convenient and secure for consumers (CIMB, 2018a). In typical e-wallet architectures, the e-wallet application provider maintains an account for the user in an e-wallet server. The e-wallet server interacts with both merchant systems such as a POS system and conventional payment card authorisation and processing systems via the Internet to complete transactions (Brophy, 2019; Jones, 2017). Generally, e-wallet applications do not store the user's payment card information on the user's mobile device. Rather, the e-wallet application "tokenises" the payment card. With payment card tokenisation, an alias or placeholder account number remains stored on the user's mobile device. The actual payment account information is stored with the e-wallet server (Toksoz & Price, 2017).

In a simple word, now users can make payments through their e-wallet instead of giving the cashier the cash from the consumer. In detail, users can make payments through e-wallets, which are in essence of applications on the user's mobile device that

can be loaded with money and used to pay for goods and services (Tan, 2018). In other words, an e-wallet typically denotes to the application of mobile that can be mounted on a user's smart device to trail its payment tools. Payment instruments can include electronic money, but also debit and credit cards. E-wallets regularly provide added features for the benefit of users (Machani, 2016).

Similarly, e-wallet is a payment device where all the transaction can be made online (Chetty, 2014). E-wallet also alike traditional wallets (Taghiloo, Ali Agheli, & Rezaeinezhad, 2010). In today's technology world, many multinational corporations such as Google, Apple and Microsoft are somehow in e-wallet banking enterprise, and vice versa (Ergeerts, Schrooyen, Beyers, De Kock, & Herck, 2012). This is a simple financial transaction medium because it saves all the details of the card, card management, cash, currency and coins (Chetty, 2014). In sum, the e-wallet technology is an innovative concept in the current situation. It is treated as a virtual wallet that facilitates instant payment and transactions via a smartphone facility. This advanced technology can help consumers access financial services more easily and provide a platform for banks and non-bank entities to expand their business (Singh et al., 2017).

2.2.1 Essential of Mobile Banking Toward E-Wallet Banking

As "mobile banking is a convenient way of allowing customers to access a wide range of the highest quality financial services without any time or place restrictions" (Alalwan, Dwivedi, Rana, & Williams, 2016, p.130). This further aid their customers to perform their banking transactions twenty-four hours daily via their mobile phones without to go to banks. In the beginning, financial institutions started to introduce branchless banking technology, from internet banking and, and now it is widely innovated into mobile banking. With the rapid spread of Internet-enabled mobile

phones, mobile banking is a newly emerging banking channel for financial institutions (Foo-Wah *et al*., 2019; Tseng & Fan, 2017). Mobile banking is mostly used to enlarge the base of consumer, increase operations, lessen costs and create supplementary revenue sources for financial institutions (Shaikh & Karjaluoto, 2015).

Recently, the financial institution is feeling the tremendous pressure of market changes today, especially in the constantly changing technology landscape and revolutions. The banking transformation started from the local-centric, which included branches and ATMs, then to place-centric, which is internet banking business. Internet banking also considers as equipment-centric as it can be accessed anywhere and anytime, which is available 24 hours a day and 7 days a week (Union Bank, 2019). This aid in solving the issues in the local-centric banking where reduce the queues of customers in traditional banking. In other words, the customers of local-centric banking must go to physical locations such as branches or ATMs, which may be far from them. In place-centric banking, customers can easily perform most of the bank transactions remotely if they have a computer with internet access. Also, equipment-centric banking keeps customers closer to the bank because users only need mobile devices to run financial services (Tam & Oliveira, 2016).

Research has recognised mobile banking as a channel of e-banking, a significant information system, expansion of system of e-payment and e-finance subset (Aderonke & Ayo, 2010; Luo, Li, Zhang, & Shim, 2010; Ratten, 2013; Schierz, Schilke, & Wirtz, 2010; Shaikh & Karjaluoto, 2015). A comprehensive outline of the payment system and a description of two forms of payment systems, specifically wholesale and retail. Wholesale payment is succeeded and determined over an innovative, advanced and specialised money transfer system named the Real Time

Gross Settlement Systems. Payment of retail is typical banking transactions that can be made via paper tools such as checks, electronic channels, products and services (including terminal point-of-sale, ATMs, internet, mobile, credit and debit cards). E-payment transactions can be split up into e-money and e-financial transactions. E-money transactions do not certainly involve users to have bank accounts. These kinds of transactions are very widespread in developed nations (Shaikh & Karjaluoto, 2015).

On the other hand, the e-finance transactions are e-banking transaction that is usually performed by customers of banks making use of different e-channels anytime, and anywhere. Policymakers, controllers, investigators and practitioners recognise the significance of mobile banking in simplifying financial transactions and are an effective means of providing banking services to the public, particularly those who are not in the banked population. Therefore, mobile banking has become a vital e-banking channel for e-wallet banking. Due to its importance, some countries have begun to regard mobile banking as an independent e-banking channel, not just an extension of online banking (Lee & Chung, 2009; Ramayah, Chiun, Rouibah, & May, 2014; Shih & Fang, 2006; Susanto, Chang, & Ha, 2016).

Mobile banking is measured as a valuable and significant value-added mobile commerce application for service of e-wallets (S. Singh & Srivastava, 2018). It is the evolution of e-banking which enables individuals to perform their financial or non-financial transactions by using mobile or handheld devices (Oliveira *et al*., 2014; Van Der Boor, Oliveira, & Veloso, 2014). The common activities which can be completed through mobile banking are funds transfers, make payments and cell phone recharging which are all categorised as financial transaction-based; when viewing account balances, the transaction history and text message (SMS) alerts for viewing account

activity are classified as non-financial or financial information based trading services (Gupta & Arora, 2017; Yes Bank, 2019).

Furthermore, it is necessary to know that e-wallet is the extended family of mobile banking (MobileAPPtelligence, 2015; Moser, 2015; Vitex, 2017). This advanced features of mobile banking which including e-wallet not only allow users to make payment by using the QR code (Hong Leong Bank, 2017; MOLPay, 2016), it also allows the user to send "digital money" or e-money to a receiver who has a mobile phone. It requires the sender to have a bank account, where the receiver can only withdraw cash in ATM using their mobile phone number and a personal identification number (PIN), which is sent to their mobile phone (Mothobi & Grzybowski, 2017). To implement mobile banking, sophisticated technologies of downloadable mobile applications are needed as the points of access to mobile banking (Shaikh & Karjaluoto, 2015).

Although there are few studies such as Akturan and Tezcan (2012); Masrek, Mohamed, Daud and Omar (2014) cite that mobile banking serves as an innovative communication channel for customers to interact with banks through their portable device. However, Shaikh and Karjaluoto (2015) argue that there is a need to have an explicit term that captures the term of a portable device for mobile banking. Therefore, mobile banking is a product or service provided by the financial industry through mobile devices which including mobile phones, smartphones or tablets (Gupta & Arora, 2017). Shaikh and Karjaluoto (2015) further highlight that the usage of laptops should not be considered as mobile banking because their user interface is the same as personal desktop computers. Compared with mobile banking, laptops are more aligned with the online or Internet banking categories.

Additionally, mobile banking offers many benefits and advantages to not simply just for financial institutions, but also to the customers or users (Mahad, Mohtar, Yusoff, & Othman, 2015). This is a self-service technology delivery channel that offers great benefits to consumers, including universal access, convenience, mobility and personalisation and is free from temporal and spatial constraints (Gupta & Arora, 2017). Also, the technology of mobile banking allows customers to make their transactions anytime and anywhere into their e-wallet banking (Hajare *et al*., 2018; Koenig-Lewis, Palmer, & Moll, 2010). Likewise, the power of digital technology for financial institutions not only offers convenience for e-wallet customers, but it also maintains a healthy of business where it brings efficiency to the financial institutions, and make the new marketing tools for financial organisations to secure new markets (Gummerus & Pihlström, 2011). As a result, the use of mobile banking platforms has led to the provision of quality service of an e-wallet (Riquelme & Rios, 2010). However, these advantages can only materialise if e-wallet is used by the intended users (Koenig-Lewis *et al*., 2010; Shaikh & Karjaluoto, 2014).

Besides that, there are several researchers use various terms to represented mobile banking, including m-banking (Afshan & Sharif, 2016; Gupta & Arora, 2017; Tam & Oliveira, 2016), mobile money (Mothobi & Grzybowski, 2017), branchless banking (Ivatury & Mas, 2008), m-payments, m-finance, m-transfers (Donner & Tellez, 2008; Mahfuz, Khanam, & Mutharasu, 2016), or pocket banking (Tam & Oliveira, 2016). Furthermore, mobile banking is often an alternate delivery channel for a variety of financial and non-financial transactions. It enables the user to carry out real-time transaction anytime and anywhere. In Malaysia, there are only thirteen banks in Malaysia offering mobile banking compared to thirty-two banks that offering banking

in 2017. However, in 2018, only four banks are newly offering mobile banking services to their customers as shown in Appendix B (Bank Negara Malaysia, 2017a). Then, there is only one bank was added into the list in 2019 Bank Negara Malaysia (2019c).

2.2.2 Essential of E-Wallet to E-commerce

E-commerce is a prospect for companies to increase sales. Electronic payments (e-payments) have been established to simplify transaction of e-commerce between users and sellers (Junadi & Sfenrianto, 2015). In the context of e-commerce, e-payments are thoroughly linked to electronic transactions, and e-payments are stated as payment processes that do not use paper tools (Nguyen & Huynh, 2018). The progress of the Internet and the emergence of e-commerce support the digitisation of the payment process by supporting various e-payment options, including contactless payment methods, payment cards, electronic cash, e-wallet banking and so on. E-payment services are becoming more and more popular and are now in a transitional period. It is possible to achieve a promising future through technological innovation (Anna, 2019; Bezhovski, 2016; Nguyen & Huynh, 2018).

Starting the year 1990, the emergence of e-commerce introduced a unique form of business transactions for consumers and businesses. In today's business climate, change is much more rapid and constant than ever before. In fact, developments such as the digital economy, e-commerce, and e-business give today's business world a completely different face from the one it wore even ten years ago (Steiger, 2013). The definition of e-commerce is grounded on an online perspective of its commercial activities. E-commerce delivers the ability to buy and sell products, information and services through the internet and other online atmospheres (Maroofi, Kahrarian, &

Dehghani, 2013; Roach, 2019). For any transaction activity, secure and reliable exchange of funds between the parties involved is very important. In an environment of e-commerce, payments are made in electronic form, so they are called e-payment (Kaur & Pathak, 2015).

As e-commerce continues its rapid growth in the region, e-wallets have become one of the most trusted and preferred ways to pay online (Koduri, 2015). E-payment systems are believed as the backbone of e-commerce and one of the most important aspects. It can be distinguished as payment services using information and communication technologies, including integrated circuit (IC) cards, encryption and telecommunications network (Raina, 2014; Raja, 2008). An operative e-payment system reduces trade costs and is considered important for the functioning of capital and the interbank market. As technology advances, e-payment systems take many forms, including e-wallet, debit cards, credit cards, electronic cash and system of checks, smart cards and mobile payments (Bezhovski, 2016; Wróbel-Konior, 2018).

E-wallet in e-commerce must secure. The user's credit card number, smart card or other personal information should not be threatened, and payment can be made without the participation of a third party. It makes e-payments can be conducted directed at any time via the internet and forming an e-commerce environment (Rouse, 2019; Shaikh & Karjaluoto, 2015). The e-payment system is part of e-commerce. Efficient payment systems decrease the cost of bartering goods and services and are essential for interbank, money and capital markets (Kaur & Pathak, 2015). With the advent of online purchases and e-commerce, the forms mandatory for payment systems need to change, forcing them to digitise. Consumers want to move from cash payments, requiring them to carry leather wallets or cash-filled fabrics with them, making it a

theft-prone that tends to pay with plastic cards, now for contactless payments via digital channels, e-wallet (Jones, 2017).

The use of e-wallet is particularly convenient for e-commerce because customers do not have to fill out an order form at the separate site when purchasing items for the reason that the information is already stored and mechanically restructured and included in the order field of the merchant's site (Sawant, 2019). The use of e-wallet aids to deviate from the cash economy. In this process, all transactions are considered in the economy, which helps to reduce the size of the parallel economy (Mahapatra & Patra, 2016). Payments made through wireless devices such as mobile phones and smartphones are considered to provide more convenience, reduce transaction payments, and increase the security of e-payments (Hoofnagle, Urban, & Li, 2012). This e-wallet transaction also makes it easy for businesses to accumulate useful information about their customers and their purchases behaviour.

In sum, traders sell goods to online customers, and clients reimburse the prices through the assistance e-wallet. In the offline world, payments are made through cash in a physical wallet. In online sales, accepting payments is part of the transaction classification (Manzoor, 2010). The popularity of e-wallet is very different across countries, in part because of differences in telecommunications infrastructure regulation and preparedness frameworks. In developed countries, new payment services based on the Internet and mobile phones are growing (Kaur & Pathak, 2015).

2.2.3 QR Code

Recently, with the cumulative popularity of e-commerce application and the incessant development of the technology of communication, Quick Response (QR) code

payment as an innovative way of payment, has developed rapidly on a global scale, which is not only an important business growth point for mobile operators. It also attracted subjects such as financial institution, international card company, internet technology company and third-party payment institution and another form of the subject (Sorensen, 2018; Zhang, 2017).

The QR code is a code of two-dimension that accounts symbol data of the information in a black and white pattern according to certain rules, some of which are distributed in a plane (Bietenbeck, Zimmermann, Weis, Pauli, & Herwig, 2019; Hayashi & Bradford, 2014). In detail, the QR code contains a black frameset in a grid of square on a white background. The code can be classified by the device of imaging, such as the smart device camera lens or a scanner (Chen, 2017; Wong, 2018). Then extract the mandatory data from the patterns found in the horizontal and vertical image component (Kongarchapatara, 2018).

The QR code was first developed in Japan in 1994 by Denso Wave, a division of Denso Corporation at the time, for use in the automotive industry particularly for efficient and accurate inventory checks (Denso ADC, 2011). Subsequently, this QR code instrument was creatively used by marketers and advertisers in a wide range of promotional activities because of its ability to combine traditional and interactive media to make it easy for users to engage with marketers and other users (Harrington, 2018). As indicated by Okazaki, Li and Hirose (2012), the key benefit of the QR code is its crucial role in bridging offline and mobile media in multichannel marketing. For instance, a shopper can simply scan a QR code with her mobile device, and then users can proximately redirect to campaign site of the advertiser, or a customer may scan a

QR code on print advertisement in order to participate in marketer's loyalty scheme or access to further detail of products and/or services (Kongarchapatara, 2018).

A QR code can contain a much greater amount of data in a smaller space, and it can be read more reliably with very high speed. The "0" and "1" bitstreams that composite the internal logic of the computers are used wisely in the code coding concept. Many corresponding binary geometries are utilised to signify information of numerical value. It robotically develops information via an imaging device of input or a device of optically scanning device (QRCode, 2019). There have numerous mutual features of barcode technology, where each code has its own set of custom characters; each character inhabits a confident width; it has a convincing function of calibration (Stazzone, 2019). Simultaneously, it robotically recognises different information lines and handles deviations in the rotation point of the graphics. In addition, the QR code has the advantage of being able to maintain a large amount of confidentiality, information, security and reliability (Zhang, 2017).

2.2.4 How Can QR Codes Used to Make Payment

Technological advancement has aided the drive of e-wallets adoption. For example, the creation of a QR code allows a user to scan and pay using a mobile device. This aids merchant such as stall hawker stalls or newspaper store vendor, while allowing consumers to escape of hassle of carrying cash with no worries (Yai, 2018). The smartphone-based of e-wallet service will enable payments between customers and merchants without the intervention of third-party players such as card company, payment gateways and virtual number payment solution providers (Charlton Media Group, 2018).

2.2.4.1 Paying Merchant with QR Scanners

The customer clicks into the scanning application of QR code and shows a unique QR code to the merchants. Merchants will utilise the application of mobile payment to scan QR codes to classify customers and deducting money from their e-wallets (Charlton Media Group, 2018).

2.2.4.2 Paying Merchant Without QR Scanners

For this issue, the merchant shows the QR codes to the consumer and the consumer will scan it using the scanning application of QR code on the mobile phone. This application will recognise the merchant. Then the consumer enters the amount due and completes the payment (Idris, 2018; Maybank2U, 2019).

2.2.4.3 Paying Individual

These typically occur among private individuals. For example, a taxi charge must be paid when someone goes down or rents a landlord. Therefore, both the paymaster and the beneficiary open the payments application of QR scanner. The paymaster has to scan the beneficiary's unique QR code, key in the amount of payment amount and do the transactions (Zhang, 2017).

2.3 M40 Millennials

This part presents a review of the relevant literature to help understand the M40 millennials. A literature review of millennials and M40 will be involved in the following discussion. In short, M40 millennials in this study is determined by the birth years 1981 to 1996, and households that earned between RM 4,360 and RM 9,619 per month in Malaysia.

2.3.1 Millennials

Generation giving a chance for people to pay attention to the status of Malaysians in the life cycle of young adults, middle-aged parents or retirees, and membership in the individual groups they were born at the same time. Giving by Pew Research, the definition of Millennium is recently defined as a person born between the year 1981 and the year 1996 (Pew Research Center, 2018, 2019).

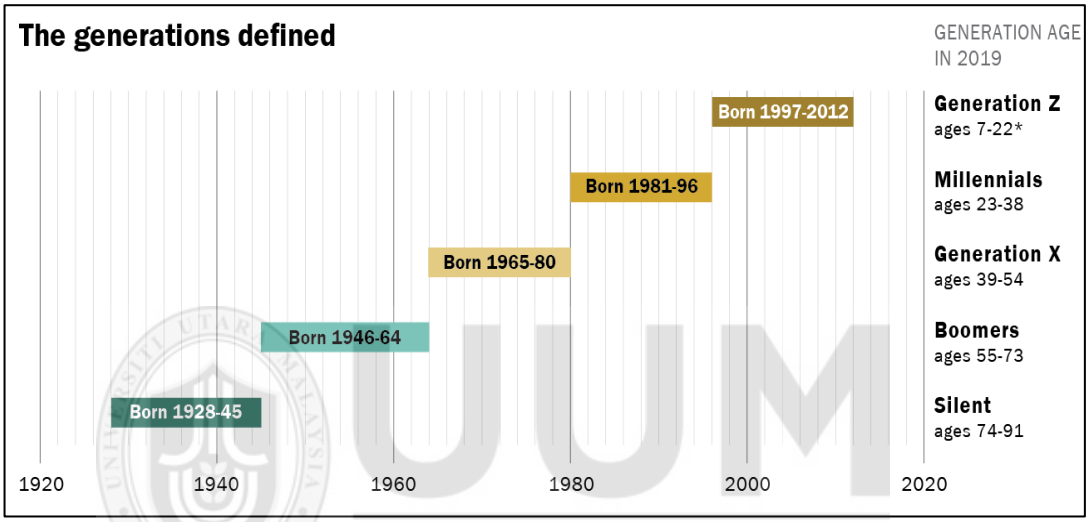


Figure 2. 1: The Generations Defined
Source: Pew Research Center (2019)

Leon (2018) called the millennial generation as "digital natives", the "native language" of the digital language of computers, the world wide web and video game. AMP News (2019) reveals that natives of digital are used to receive information speedily, and they like multitasking. They like graphics for text, games for "serious" working, and they work well in the setting of the network. Hasz (2018) once again declared that the millennial generation was irritated. They like convenience and flexibility, prefer to communicate via instant messaging or use email text (Alton, 2017).

Not surprisingly, millennials have attracted their identity from their connection with technology. For the survey by Nielsen (2014), 24 percent of millennials said their

generations was technically unique because of technological adoption. Millennials comprehend technology power. Overall, 74 percent of respondents said that technology making their lives relaxed, and 54 percent of respondents said that technology could help them get nearer to friends and families. The amazing number, 83 percent of respondents revealed that they slept with their smartphone. At the same time, Nielsen (2014) reported that millennials are more readily engaged in online services than any other generation, such as online transactions, online banking and online purchase insurance. Given the characteristics of millennials, it is rational to suppose them to perceive themselves as skilled users of technology and to have an endless information stream.

In particular, one of the most frequent strands in the millennial generation is the dependence on phones. Millennials not only utilise smartphone for standard purposes like phone and text messaging but also use them for social media, game, music, alarm clock, picture, emails, etc. (Alton, 2017). The millennial generation is the Internet-borne, fast-paced generation of technologists and millennials. This has created a strong connection, and today, mobile phones can act as phones, computers, gaming device, television, and so on. This phone is viewed as a live channel, and when people do not have phone calls, there is panic (Pew Research Center, 2019). This is crucial evidence because it involves businesses because of Millennials' decisions about their businesses and manufactured goods are closely affected by social media and mobile application.

Millennials are far from any form of face-to-face communication with anyone. The Gallup poll in 2014 confirms many of the facts that are believed to be true: SMS is now an extraordinary phone call, the main method of communication of the millennium (Cimperman, Makovec Brenčič, & Trkman, 2016). The transition from

texting or email communications is possible because many millennials believe that phones are sometimes annoying or even nasty. In addition, work-oriented employees want to understand what to do swiftly, not including having to talk to others with unnecessary emotions (Valentine & Powers, 2013). Millennials prefer to surf the Internet or text or email with people who need to talk to them or continue to visit the company's website for an online appointment. This movement is also manifested in their shopping behaviours, particularly when shoppers use products they do not know well (like cars and tires). Millennials have a solid preference for friends and family when they go online and ask questions about cars. Entering the store to ask the seller is the last option (Cimperman *et al*., 2016).

2.3.2 Middle 40%

Malaysians are divided into three different groups of income, namely T20, M40 and B40. The category of T20, M40 and B40 signify the Top 20 percent, the Middle 40 percent and the Bottom 40 percent respectively. Over the centuries, the standards of the group's income have improved at each stage, which is one of the pointers of the growth of economic (Department of Statistics Malaysia, 2017).

In specific, based on Household Income and Basic Amenities Survey 2019 that prepared by Department of Statistics Malaysia (DoSM), the T20 group was well-defined with the median household income of no less than RM 13,148, while the median M40 and B40 family households rose to RM 6,275 and RM 3,000 respectively. From the report, the median household income of T20, M40 and B40 showed a compound annual growth rate (CAGR) of higher than 6 percent (Department of Statistics Malaysia, 2017; Pillay & Samudin, 2018).

In addition, according to the department of statistics, the median monthly household income in Malaysia exceeded RM5,000 for the first time in 2016, with M40 households having the highest median increase in the income. But there is information that the revenue group definition is not set. The value of each year may grow or decline base on the GDP of a country, so the median household income is used as the determinant (Department of Statistics Malaysia, 2017; Kana, 2017).

According to Khazanah Research Institute's (KRI) latest report, the report entitled "The State of Households: Different Realities" showed national household income average for the M40 is between RM4,360 to RM9,619 a month (CIMB, 2018b; Department of Statistics Malaysia, 2017; Khazanah Research Institute, 2018). Nationally, the highest household income for a household to be categorised in the national bottom 40 percent and the middle 40 percent respectively. This means that households that earned below RM4,360 per month in 2016 are in the bottom 40 percent of all households, while households that earned between RM 4,360 and RM 9,619 per month are in the middle 40 percent of all households. Households that earned above RM9,619 are in the top 20 percent of all households (Khazanah Research Institute, 2018). In the next section, a critical review of the theories of IT and IS acceptance, and use will be discussed.

2.4 Related Theories and Model of Technology Acceptance

Dillon and Morris (1996) defined acceptance of information technology (IT) as "the demonstrable willingness within a user group to employ information technology for the tasks it is designed to support" (p.5). Technology acceptance is important since it is the vehicle that brings individuals to take part in technology. According to Alwahaishi and Snásel (2013), technology acceptance of a user is an important factor in the execution of an information system (IS) because it uses to decide the success or failure of IT products. The readiness of IT does not necessarily bring to its acceptance. A lack of user acceptance causes most of the IS failures.

The user acceptance of new IS or IT innovation is usually described as one of the most developed areas in the current IS literature (Dwivedi, Rana, Jeyaraj, Clement, & Williams, 2017). Research in this field has formed a variety of theoretical models to explain the individual intentions of using innovative technology, which have their backgrounds in IS, sociology and psychology (Davis, 1989; Taylor & Todd, 1995; Venkatesh & Davis, 2000; Venkatesh, Morris, & Davis, 2003). Therefore, before reviewing the UTAUT, there is a total of eight well-known models were introduce in the following section. Those eight well-known models are Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Theory of Planned Behaviour (TPB), Innovation Diffusion Theory (IDT), Model of PC Utilization (MPCU), Motivational Model (MM), Combined TAM & TPB (C-TAM & TPB), and Social Cognitive Theory (SCT).

2.4.1 Theory of Reasoned Action

The Theory of Reasoned Action (TRA) was developed from the viewpoint of social psychology (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), and it is a pioneer to

numerous of classical models and theories that used by human behaviours for understanding the acceptance of the technology. Base on TRA, the individual behavioural intention will control an individual behaviour, where the behavioural intention is driven by their attitude about the behaviour and subjective norm (Fishbein & Ajzen, 1975). Sheppard, Hartwick and Warshaw (1988) argue that that the validity of this model is still high even though there are numerous researchers contributed to extending this model beyond the prescribed boundary settings.

The TRA contains three main structures, constructs, namely behavioural intention, attitude and subjective norm. In particular, TRA indicates that an individual's behavioural attitude about the behaviour and subjective norms (BI = A + SN). If someone is going to do something, then that person is to be expected to do so. In particular, attitude toward behaviour refers to a person's positive or negative feelings about performing that behaviour (Fishbein & Ajzen, 1975, p.216). Next, another major structure of TRA is a subjective norm, which is defined as "the person's perception that most people who are important to him or her think he should or should not perform the behaviour in question" (Fishbein & Ajzen, 1975, p.302).

Regarding a simple term, TRA believes that an individual's voluntary behaviour is predicted by his or her attitude toward such behaviour and that he or she believes that if he does this behaviour, others will see it. But, Ajzen (1985) revealed that TRA is not fit for the case in which the people have low levels of volitional control. Davis (1989) stated, "TRA is a general model, and as such, it does not specify the beliefs that are operative for a particular behaviour" (p.984). If an individual perceives and believes that the outcomes of performing a particular technology are positive, he or she will perform that behaviour with a positive attitude. On the other hand, if an individual

perceives and believes that the outcomes of using innovative technology are negative, he or she will not perform that behaviour and will have a negative attitude towards performing.

In fact, TRA is the backbone for some models and theories in the technology acceptance field. The TRA is the foundation for two significant theoretical directions, which are the first is the development of a more comprehensive theory of Theory of Planned Behaviour (TPB) (Ajzen, 1991); and second, the development of a further concise and commonly used of Technology Acceptance Model (TAM) (Davis, 1989; Davis *et al*., 1989). Davis, Bagozzi and Warshaw (1989) posit TRA to describe the individual technology acceptance and found that the variance explained was similar to the use of TRA in the other behavioural context. Nevertheless, the TRA model does not give considerable attention to other predictors; like effort expectancy and performance expectancy that might have a substantial impact on behaviours. Therefore, Davis *et al*. (1989) practice TRA in their empirical study on computer user acceptance which focused on the use of e-mail and found that the association between usefulness and usage behaviour was higher correlation than ease of use.

2.4.2 Technology Acceptance Model

In 1989, Davis developed one of the most powerful extensions of TRA (Venkatesh *et al*., 2003) to explain individual system use in the workplace, which is known as the Technology Acceptance Model (TAM). To start, TAM is a modification of TRA that is specific for the modelling of user acceptance of IS. TAM was originally introduced by Davis (1986). TAM was modified from the TRA, which specifically tailored to predict and describe the acceptance and adoption of IT in an organisational context.

Two beliefs identify the attitude of a user toward the actual use of new IT or IS or cognitive response, namely perceived ease of use and perceived usefulness.

Perceived usefulness and perceived ease of use were hypothesised to be essential determinants of user acceptance. Perceived usefulness denotes to "the degree to which a person believes that using a particular system would enhance his or her job performance" (p. 320), whereas perceived ease of use is "the degree to which a person believes that using a particular system would be free of effort" (p. 320). This model hypothesises that a technology that is useful and easy to use would lead to a positive intention to use it. In addition, perceived ease of use also has a causal influence on perceived usefulness. TAM offers a basis for tracing the influence of design features or external factors directly on internal beliefs and do not hypothesise to have any direct influence on attitude. Those external variables only affected indirectly through the cognitive response toward the attitude and technology usage.

Base on to Davis, Bagozzi, and Warshaw (1989), the subjective norm was eliminated from the model as a subjective norm are difficult to influence directly on the behavioural intention from the indirect impact of attitude in TRA. Therefore, TAM considers it is less general than TRA, and it is more powerful in explaining and predicting the adoption of IS (Davis *et al*., 1989). TAM was used in previous studies in several technology contexts such as Crabbe, Standing, Standing, and Karjaluoto, (2009); Lules, Omwansa, and Waema, (2012); Piriyakul *et al*., (2015); Yu, Ha, Choi, and Rho, (2005) to predict and describe the acceptance of IT-related behavioural and usages including mobile banking, television commerce and internet business transaction. However, TAM seems to be a useful model; subsequent studies have

identified its limitations and determined that it is necessary to extend and modify it with other relevant variables and theories.

Also, it is worth noting that TAM2 has been extended from TAM by using subjective norms as an additional intention predictor (Venkatesh & Davis, 2000). TAM2 developed by Venkatesh and Davis in terms to explain more about the perceived usefulness and behavioural intention with omitting attitude. The extension applied new determinants such as subjective norm, job relevance, image, output quality, result demonstrability, experience and voluntariness into the body of TAM. They found that the extension of TAM and its new determinants have significantly influenced user acceptance. One of the most remarkable new determinants is the subjective norm. Subjective norms involve individuals belief that thinks they are important to him or her that he or she should pass perform the behaviour in question as defined by Fishbein and Ajzen (1975).

In addition, Venkatesh and Davis (2000) established the foundations of gender integration in their research, which is important to understanding the role of social impact in the early adoption of technology decisions, including the adoption of new sustainable technologies. However, the criticism of TAM2 is that overall of the model cannot explain the variance of the systems user's more than 34 to 52 percent. Another criticism is the model becomes more complex and less parsimonious compared to the original TAM.

2.4.3 Theory of Planned Behaviour

In TRA, the behaviour must be voluntary, which does not work in an organisational context. To overcome this issue, Ajzen (1991) developed the Theory of Planned

Behaviour (TPB) by adding the "perceived behavioural control" to be applicable for non-voluntary users. TPB uses to cover volitional behaviours for predicting behavioural intention and actual behaviour. As claimed by the TPB, individual behaviour is determined by their behavioural intentions. While, their behavioural intentions were driven by subjective norms, attitude towards behaviour, and perceptions of behavioural control (Ajzen, 1991, 2001).

In this theory, perceived behaviour control states to the difficulty to perform a behaviour or perceived ease (Ajzen, 1991). Generally, the better attitudes and subjective norms and better control, the stronger the intention of people to act (Ajzen, 1991). Ajzen (1991, 2001) also demonstrates that the capability of TPB to provide a valuable theoretical framework to predict and understand the acceptance of new technology (Harrison, Mykytyn, Jr., & Riemenschneider, 1997; Mathieson, 1991; Taylor & Todd, 1995).

Although TPB introduced a new variable, namely perceived behavioural control, but limitations continue to exist. The assumption that perceived behavioural control predicts behavioural intention may not consistently occur. Also, some criticisms perceived behavioural control was not identified as the specific belief that predicted the construct (Taylor & Todd, 1995).

2.4.4 Decomposed Theory of Planned Behaviour

Next, with the combination of the determinants and characteristics of TPB and TAM, Decomposed Theory of Planned Behaviour (DTPB) was developed (Taylor & Todd, 1995). The reason for the integration of both theories is to provide an in-deep understanding of technology acceptance. Even though DTPB is similar to TPB in

predicting the behavioural intention, but the DTPB decomposes attitudes, subjective norms and behavioural control into an important belief structure in the setting of technology adoption (Venkatesh *et al*., 2003).

The attitude constructs in DTPB was deconstructing into perceived usefulness, ease of use and compatibility. In addition, the authors decomposed subjective norms into the peer's influence and the superior's influence. Moreover, the authors decomposed perceived behavioural control into self-efficacy, resource facilitating conditions and technology facilitating conditions. According to Taylor and Todd (1995), DTPB had higher explanatory power than TAM and TPB. Bradley (2009) indicated the weakness of DTPB is "the TAM explains over 50 percent of the variance of behavioural intention with two variables. The DTPB requires seven variables to explain 60 percent" (p. 285). According to Taylor and Todd (1995), TAM explained 52 percent of the variances toward the behavioural intention. However, TPB explained 57 percent of variances toward behavioural intention, while DTPB explained 60 percent of the variances toward the behavioural intention.

2.4.5 Combined TAM-TPB

Moreover, the combined TAM and TPB models (C-TAM-TPB) has integrated the predictors of perceived usefulness and perceived ease of use from TAM into TPB (Taylor & Todd, 1995). In a more complicated methodology, Taylor and Todd (1995) combined the predictors of TPB with perceived usefulness and perceived ease of use from TAM to provide a hybrid model. The main variable is the attitude toward behaviour (adapted from TRA/TPB), subjective norm (adapted from TRA/TPB), perceived behavioural control (adapted from TPB), perceived ease of use and perceived usefulness (adapted from TAM) in their studies of measuring the use of IT.

In their study, they combined TAM with social influence and behavioural control. All of this is to enable an experienced and inexperienced consumer group to compare business school students using computerised resource centres. Finally, they established that the combined TAM-TPB model could be used to predict experienced and inexperienced IT user behaviour.

2.4.6 Motivation Model

The Motivation Model (MM) is a common motivational theory in explaining Davis, Bagozzi and Warshaw (1992) use motivation theory to clarify the acceptance and use of technology (cited from Venkatesh *et al*. 2003). There are two core drivers of technology acceptance, namely intrinsic motivation and extrinsic motivation. As quoted in Venkatesh *et al*. (2003), intrinsic motivation is the perception that consumers choose to perform an activity "for no apparent reinforcement other than the process of performing the activity per se" (Davis *et al*., 1992, p.1112).

Besides that, as mentioned by Venkatesh *et al*. (2003), extrinsic motivation justify the reason consumers choose to perform the activity "because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself, such as improved job performance, pay, or promotions" (Davis *et al*., 1992, p.1112). According to Deci (1975), it identifies intrinsic motivation as an environment-related behaviour that tends to provoke an individual's need for competence and self-determination. If the person does not enjoy the fun of the event, this intrinsic motivation will be reduced. However, extrinsic motivation activities involve extrinsic rewards, so external rewards are associated with satisfaction of primary drives to achieve the goals. For instance, positive incentives can be money or praise or social consent or positive response into their group of the social reference group.

The concepts of extrinsic and intrinsic motivation are also embodied in other technology acceptance models using different constructs. For example, perceived usefulness, relative advantage and outcome expectation are different constructs that capture the concept of extrinsic motivation. On the other hand, hedonic motivation and hedonic outcomes capture the concept of intrinsic motivation. However, even though the MM was useful, but the model explained only between 28 percent (Igbaria, Parasuraman, & Baroudi, 1996) and 62 percent (Davis *et al*., 1992) of the variance in behavioural intention. The fact that between 72 percent and 38 percent of the variance was unexplained suggest the need for further research to find out if any unmeasured variables could contribute to the variance in behaviour.

A wide range of psychology research institutions uses a common motivation theory to test individual behaviour. Some studies such as Igbaria, Parasuraman and Baroudi (1996) and Venkatesh and Brown (2001) have applied motivational theories to certain settings (Venkatesh *et al*., 2003). Vallerand (1997) reviews the whole model of motivational theories. In the area of IS or IT, Davis, Bagozzi and Warshaw (1992) and Venkatesh and Speier (1999) applied motivation theory to study the acceptance and use of new technologies.

2.4.7 Model of Personal Computer Utilization

The Model of Personal Computer Utilization (MPCU) is mainly derived from the theory of human behaviour that proposed by Triandiss (1977). It raised the controversy context projected by TRA and TPB. Thompson, Higgins and Howell (1991) adapt and refine the theory of human behaviour from Triandis model by paying attention to the IS or IT setting and establishing the use of MPCU for predicting user behaviour rather than the intention.

In detail, Thompson *et al*. (1991) use research to predict the behaviour use of personal computers (PCs). They rely deeply on PC research models. The core of MPCU development includes long-term consequences, job fit, social factors, complexity, affect towards use, and facilitating conditions that influence the use and promotion of this situation. In brief, job fit is the degree to which people believe that using PCs can improve their performance on job task (Thompson *et al*., 1991). Furthermore, based on Rogers (1995), complexity is a level of innovation that is considered not easy to understand and use. Besides that, long-term consequences are defined as the result of future payments (Thompson *et al*., 1991). As Fishbein & Ajzen (1975) explain, the construct of affect denotes an individual's perception and evaluation of an object, person, problem or event.

In addition, Thompson *et al*. (1991) found that the three components of perceived consequences and social norms are appropriate between the complexity of use, job fit, capabilities of PCs, and long-term consequences, and have a large impact on usage. The outcomes illustrate that the three components of expected consequences (complexity of use, fit between the job and PC capabilities, and long-term consequences) and social norms have a large impact on the PCs utilizations, so the model is designed to predict the use of behaviour but not an intention. They found that: "Behaviour is determined by what people would like to do (attitudes), what they think they should do (social norms), what they have usually done (habits), and by the expected consequences of their behaviour" (Thompson *et al*., 1991, p.126).

The concepts of the job-fit, long-term consequences, complexity, affect towards use, social factors, and facilitating conditions constructs embodied in MPCU also found throughout the development of technology acceptance models. For example, job-fit

construct captures the concepts of perceived usefulness, performance expectancy, relative advantage, and extrinsic motivation that embodied in different technology acceptance models.

2.4.8 Innovation Diffusion Theory

Next, Rogers' (1995) innovation diffusion theory (IDT) was established from sociology and has been implemented to study some innovations extending from tools of agriculture to organisational innovation (Tornatzky & Klein, 1982). In addition, Moore and Benbasat (1991) adapted the innovative features proposed by Rogers and completed a set of constructs for individual acceptance of technology by included the construct of image and voluntariness of use.

The IDT emphasises that individuals have varying degrees of readiness to adapt to innovation. Rogers (1995) had split up into five types, namely innovators, early adopters, early majority, late majority, and laggards. The willingness of each carrier and its capability to adapt to innovation depends on their psychological processes divided into the following levels, namely awareness, interest, assessment, trial and adoption. If users are likely to understand innovation, then there will increase the speed of diffusion: 1) poses the advantages relative than other innovation (relative advantages); 2) companionable with present practice and value (compatibility); 3) less complex (complexity); 4) evidence that may be inadequate before adoption (trialability); 5) provide noticeable results (observability).

Rogers (1995) argues that the great interest in innovation communication is that "getting a new idea adopted, even when it has obvious advantages, is very difficult" (Rogers, 1995, p. 1). The innovative decentralised research centre focuses on how to

adjust innovation and the reasons behind innovation to adopt at different speeds. Rogers defines diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 1995, p. 5), and ascertains five aspects of an innovation that influence adoption and acceptance behaviour, namely relative advantage, complexity, compatibility, trialability, and observability.

In addition, Karahanna, Straub and Chervany (1999) adjusted the IDT function to evaluate the pre-adoption and post-use differences of Windows 3.1 software. The assessment is based on an analysis using the term trust and attitude. The key to successful technology deployment is that it must be reliable, easy to use, compatible with today's progress, and more. It is essential to be kept in mind that the success of new technologies depends entirely on how users and users receive and use them. Without it, any new and old technology will be useless.

2.4.9 Social Cognitive Theory

Social cognitive theory (SCT) is widely applied to describe human behaviour (Bandura 1986). Compeau and Higgins (1995) have applied and extended this theory from a computer utilisation point of view; nonetheless, the nature of this model and underlying theory allows it to be extended to the widespread use of IS and IT (Venkatesh *et al*., 2003).

In SCT, ongoing self-influence of humans motivate and regulate their behaviours (Bandura, 1991). In their developed model, used some of the constructs included in the SCT to investigate the relationship between cognitive factors, namely self-efficacy, performance-related outcome expectations, and personal outcome expectations;

affective factors which including anxiety and affect; and usage. After developing and evaluating a measurement, based on the proposed model, by conducting a survey of Canadian managers and professionals, and analysing the structural model using a regression-based technique (Partial Least Squares, PLS), Compeau and Higgins (1995) found out that, in total, the model accounts for 32 percent of the variance in computing use behaviour. Results indicated that self-efficacy emerged as the most powerful predictor of usage, compared to the other significant effects of outcome expectations (especially those related to job performance), affect, as well as anxiety.

At large, Bandura's SCT (1986) describes the relationship between a person's behaviour, skills or cognitive attitudes and personal factors and the environment. Everyone can have an impact and be influenced by others or influence each other. SCT believes that individuals have the confidence to control their thoughts, feelings and behaviours, "What people think, believe, and feel affects how they behave" (Bandura, 1986, p. 25). With this, Bandura describes the views of human behaviour where their belief in themselves is an important function of control exercises. Therefore, the word "No man's an island" is because people's lives are not separate. People share the common belief to work with each other and improve their desire to live together. Therefore, environmental and social systems have a very large impact on human behaviour.

On the other hand, Compeau and Higgins (1995) expanded the SCT to study the use of computers. Based on SCT, Compeau and Higgins test behavioural modelling, in which the acquisition of individual knowledge can be directly linked to the observation of others in the context of social interaction, experience and influence of external media. The Compeau and Higgins (1995) model stems from the cognitive impact of

SCT on behaviour and examines two key variables, outcome expectations (performance and personal) and self-efficacy. In summary, five main constructs influence the use of information technology, namely personal outcome expectations, performance outcome expectations, self-efficacy, anxiety, and affect.

According to Ratten (2013), SCT has the advantage over other models and theories because it integrates both individual and organisational level analysis, which means that it incorporates technology innovation that is not always under the control of users but mandated by an organisation as well. Despite the advantages of the SCT model, the remaining 68 percent of the unexplained variance in user behaviour (Compeau & Higgins, 1995) encouraged further researches to be conducted to explore other variables and propose models that might explain user behaviour.

2.5 Unified Theory of Acceptance and Use of Technology

The Unified Theory of Acceptance and Use of Technology (UTAUT) was developed by Venkatesh, Thong and Xu (2003). The UTAUT model was established based on the extension of the well-established Technology Acceptance Model (TAM) (Davis, 1989; Davis *et al*., 1989). In order to understand the acceptance and adoption of IT, Venkatesh, Morris, Davis, & Davis (2003) suggested a comprehensive model named UTAUT.

This UTAUT model brings together a variety of IT acceptance models that integrate the elements of eight well-known models, as discussed in the above sections. These eight models and theories included Theory of Reasoned Action (TRA) for prediction of human behaviours (Fishbein & Ajzen, 1975), Technology Acceptance Model (TAM) to predict individual's acceptance and usage (Davis, 1989), Theory of Planned

Behaviour (TPB) that extended from TRA to predict intention and behaviour (Ajzen, 1991), Innovation Diffusion Theory (IDT) with the aid of features of the innovation to predict use and acceptance (Moore & Benbasat, 1991), Model of PC Utilization (MPCU) to predict PC utilization (Thompson *et al*., 1991), Motivational Model (MM) to predict the motivation of an individual toward use (Davis *et al*., 1992), Combined TAM & TPB (C-TAM & TPB) use to offer a hybrid model by joining the TAM and TPB (Taylor & Todd, 1995), and Social Cognitive Theory (SCT) (Bandura, 1986).

The UTAUT was developed to investigate the perception of individuals regarding the degree of acceptance of technology in an organisational context (Venkatesh *et al*., 2003). UTAUT also used to measure the information systems' behavioural intention by users (Nguyen & Huynh, 2018). In addition, the UTAUT model has been proven and verified to be better than the other eight individual models, making it very beneficial for researchers who study determinants of the acceptance of technology (Venkatesh *et al*., 2003). The model contains four determinants that predict the behavioural intention to use technology and the real use of technology. Those determinants are effort expectancy, facilitating conditions, performance expectancy and social influence.

Also, the UTAUT model has a strong and comprehensive theoretical foundation. Through empirical analysis, Venkatesh *et al*. (2003) revealed that effort expectancy, performance expectancy, social influence and facilitating conditions used to simplify the major determinants of user adoption of technology, and effort expectancy, performance expectancy, and social influence are the major determinants of user behavioural intention to use technology. As hypothesised by them, attitude toward using technology, self-efficacy, and anxiety are not considered as direct determinants

that affect behavioural intention and found to have a non-significant relationship. Therefore, those factors are removed from the model before the final formulation of UTAUT. More specifically, these technology acceptance theories and models can be concluded in Table 2.1 below.

Table 2. 1
Model and Theories of Individual Acceptance

Models and Theories	Constructs
Fishbein and Ajzen's (1975) Theory of Reasoned Action (TRA) is derived from psychology to examine behavioural intention and performance.	Subjective norm Attitude about the behaviour
Ajzen's (1991) Theory of Planned Behaviour (TPB) extends from TRA by adding one variable that determines the behavioural intention and behaviour.	Subjective norm Attitude toward Behaviour Perceived Behavioural Control
Davis's (1989) Technology Acceptance Model (TAM) developed two specific variables to determine user acceptance of the technology. The Technical Acceptance Model 2 (TAM2) by Venkatesh and Davis (2000) was adapted from TAM to include more variables.	Perceived Ease of Use Perceived Usefulness Subjective Norm* Voluntariness* Experience* Image* Output Quality* Job Relevance* Result Demonstrability* * indicates TAM2 only
Taylor and Todd (1995) integrated TAM and TPB to become a C-TAM-TPB.	Perceived Usefulness Perceived Ease of Use Subjective norm Perceived Behavioural Control Attitude Toward Behaviour
Motivation model (MM) also comes from psychology to describe behaviour. Davis, Bagozzi and Warshaw (1992) used this model to examine the use of technology.	Intrinsic Motivation Extrinsic Motivation
Thompson, Higgins and Howell's (1991) Model of PC Utilization (MPCU) is adapted from Triandis (1980) theory of attitudes and behaviour to predict the behaviour of use in PC.	Perceived Consequences (Complexity, Job-Fit, Long-Term Consequences of Use) Social Factors Facilitating Conditions Affect Towards Use
Roger's (1962) Innovation Diffusion Theory (IDT) adjusted to Moore and Benbasat's (1991) information system innovations. Five variables	Relative Advantage* Compatibility* Complexity*

of the Rogers model and two additional constructs are identified.	Trialability* Observability* Image Voluntariness of Use * indicates Roger's constructs
The social cognitive theory (SCT) of Bandura (1986) was used by Compeau and Higgins (1995) to determine its information system acceptance.	Encouragement by Others Others' Use Support Self-Efficacy Personal Outcome Expectations Performance Outcome Expectations Affect Anxiety
Venkatesh, Morris, Davis and Davis's (2003) Unified Theory of Acceptance and Use of Technology Model (UTAUT) integrates the above theories and models to measure the user's behavioural intention to use technology	Effort Expectancy Performance Expectancy Facilitating Conditions Social Influence Self-Efficacy Anxiety Attitude toward Using Technology

2.5.1 Constructs of UTAUT

Venkatesh *et al*. (2003) developed the UTAUT model to find a comprehensive understanding and prediction of the behaviour of users that the previous model failed to explain. The UTAUT model contains five constructs of system-specific and designed to describe the perception of individuals regarding the acceptance and the use of a particular technology, namely facilitating conditions, effort expectancy, performance expectancy and social influence.

2.5.1.1 Behavioural Intention

Behavioural intention is "a measure of the strength of one's intention to perform a specified behaviour" (Davis, Bagozzi, & Warshaw, 1989, p.984). The behavioural intention is the subjective possibility that a person will conduct the relevant behaviour (Venkatesh *et al*., 2003). Behavioural intention is the willingness of an individual to conduct specific behaviour to use the system (Khechine, Lakhal, & Ndjambou, 2016).

Also, it refers to the willingness of an individual to adopt new technology (Gupta *et al*., 2019; Raza, Shah, & Ali, 2018). This is a kind of cognitive representation of an individual readiness before they are considered to perform a given behaviour which is measured to be the immediate antecedent of behaviour (Fishbein & Ajzen, 1975). This construct originates from the TRA, and it has been widely used across the social sciences as a basis to study behaviour intention. Behavioural intention also comes from the TAM and the TPB. Both TBP and TAM posits behavioural intention as the precursor to usage behaviour (Davis *et al*., 1989). It can be further stated that behavioural intention is the most proximate predictor of actual behaviour (Ajzen, 1991).

2.5.1.2 Performance Expectancy

Performance expectancy is "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh *et al*., 2003, p.447). Performance expectancy used to be the most solid predictor of the behavioural intention of the user in UTAUT. Generally, performance expectancy is important and valuable to help individuals to achieve their job performance better. The construct of performance expectancy is extracted from the UTAUT model. Other different model constructs that are similar to performance expectancy are perceived usefulness from

TAM and C-TAM-TPB, job-fit in MPCU, extrinsic motivation in MM, a relative advantage in DOI and outcome expectations from SCT as shown in Table 2.2.

2.5.1.3 Effort Expectancy

Effort expectancy is defined as "the degree of ease associated with the use of the system" (Venkatesh *et al*., 2003, p.450). Davis (1989, p.320) described it as "the degree to which a person believes that using a particular system would be free of effort". It denotes to the degree to which the ease is related to the use of the system. There are three constructs from the existing models hold the concept of effort expectancy, namely perceived ease of use in TAM, ease of use in IDT and complexity in MPCU as shown in Table 2.2.

2.5.1.4 Facilitating Conditions

Facilitating condition means to "the degree to which an individual believes that an organisational and technical infrastructure exists to support the use of the system" (Venkatesh *et al*., 2003, p.453). Facilitating conditions are known as the extent to which individuals who believe in the existence of structural and technical infrastructure to support them to use the system (Venkatesh *et al*., 2003). These facilitating conditions include the provision of system support, training and support of management. Other constructs from other models that are synonymous with facilitating condition are perceived behavioural control from TPB/DTPB, and C-TAM-TPB, facilitating conditions from MPCU, and compatibility from IDT as shown in Table 2.2.

2.5.1.5 Social Influence

Social Influence is a term that describes "the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh *et al*., 2003, p.451). Social influence, a factor derived from the UTAUT, is a social factor or social norm in which the user perceives that social relationships like family, friends or close peers influence his beliefs that he or she should use a technology (in this case, the e-wallet transaction via QR code) (Venkatesh, Viswanath., Thong, James, Y.L. & Xu, 2012). Social influence construct is identified in existing models, and it is originated from the subjective norm in TRA, TPB and C-TAM-TPB, image in IDT and social factors in MPCU, as shown in Table 2.2.

Table 2. 2
Roots Constructs Resulting in UTAUT Variables

UTAUT New Constructs	Root Constructs	The source of model
Behavioural Intention	Attitude towards Behaviour Intrinsic Motivation	TRA, C-TAM, TPB MM
Performance Expectancy	Perceived Usefulness Job Fit Relative Advantage Outcome Expectations Extrinsic Motivation	TAM and C-TAM-TPB MPCU IDT SCT MM
Effort Expectancy	Perceived Ease of Use Complexity Ease of Use	TAM MPCU IDT
Facilitating Conditions	Perceived Behavioural Control Facilitating Conditions Compatibility	TPB/DTPB, C-TAM-TPB MPCU IDT
Social Influence	Subjective Norm Social Factors Image	TRA, TPB/DTPB, and C-TAM-TPB MPCU IDT

2.5.2 Strengths of UTAUT

There have been several strengths and weaknesses for the UTAUT model. First, the main advantage of UTAUT is that it shows a superior factor strength. UTAUT is

widely used by researchers to explain IS and IT acceptance (Dwivedi *et al*., 2017). This theory is the most extensive version of TAM, which designed for the context of IS. Its explanatory power has benefited both theories and other TAM's versions (DongPing Tang & LianJin Chen, 2011). This model can clarify up to 70 percent of the variance towards behavioural intentions (Venkatesh *et al*., 2003).

Second, UTAUT is considered less general than another individual model. UTAUT consists of the latent variables to offer valuable insights into e-participation surveys because it takes into account the factors of information technology and social factors (Naranjo-Zolotov, Oliveira, & Casteleyn, 2018). The model has been empirically investigated and found to outperform other eight individual models, which including the popular model of TAM (Oliveira *et al*., 2014). UTAUT created the propositions that come out by different models of acceptance, including TRA, TPB, TAM, C-TAM-TPB, MPCU, MM, IDT and SCT. Because of the many similar constructs presented by several theories, and it has been found that the researchers will only "pick and choose" the constructs from these models or select their "favoured model", this resulted that other models are largely overlooked. Subsequently, Venkatesh *et al*. (2003) proposed the UTAUT, where similar constructs within these eight individual models are shown in Table 2.2 above.

Third, from the time when its original publication, UTAUT has become a benchmark model and has been used for various technologies studies in organisational and non-organisational contexts. The model was adapted and adopted in many different settings. Moreover, there are three extensive categories of UTAUT extensions or integration. First, the application of UTAUT in new context such as healthcare robots (Alaiad & Zhou, 2013), home telehealth services (Cimperman *et al*., 2016), online tickets

(Escobar-Rodríguez & Carvajal-Trujillo, 2014), mobile health (R. Hoque & Sorwar, 2017), e-book (Hsu, Lin, Chen, Chang, & Hsieh, 2017), NFC (Khalilzadeh, Ozturk, & Bilgihan, 2017), mobile payment (Teo, Tan, Ooi, Hew, & Yew, 2015), internet banking (Tarhini, El-Masri, Ali, & Serrano, 2016), mobile banking (Owusu Kwateng *et al*., 2019) and open data technologies (Zuiderwijk, Janssen, & Dwivedi, 2015), and new cultural settings such as Korea, the United State and many more.

Second, the integration of new constructs in order to enlarge the scope of the endogenous theoretical mechanisms drawn in UTAUT (Sun, Bhattacherjee, & Ma, 2009; Yue Chan, Gong, Xu, & Thong, 2008). Lastly, the third type is adding exogenous variables as predictors of the UTAUT variables (Olaleye & Sanusi, 2019; Neufeld, Dong, & Higgins, 2007; & Yi, Jackson, Park and Probst, 2006). The theory has been appreciated for its ability to inform and provide an opportunity to understand various factors which determine the user's acceptance of new technology.

2.5.3 Limitations of UTAUT

Currently, there exists no universally accepted theory to explain the acceptance of IT and IS (Kiwanuka, 2015). About a decade ago, UTAUT was widely used in IS and other fields as theoretical proof of extensive citations of the theory as evidence (Venkatesh, Thong, & Xu, 2016). A popular criticism of UTAUT is its limited practicality when it comes to the question of what single interventions drive user acceptance: "Little is known about the key antecedents that influence the UTAUT constructs" (Brown, Dennis, & Venkatesh, 2010). One technique of increasing the power of explanatory of information about technological acceptance research can explain the model in a specific context (Kuegler, Smolnik, & Räth, 2012; Venkatesh

& Bala, 2008). But, the question of what specific strategy business organisations can take to promote the acceptance of the technology (Stei & Rossmann, 2017).

In addition, many theories of technological acceptance have not been extensively studied outside developed countries (Gupta *et al*., 2019; Williams *et al*., 2015). Thus, researchers have a clear opportunity to conduct original work by gathering data in other countries such as Malaysia. There is, therefore, an opportunity for this study to embark on UTAUT research for the original cultural studies and related backgrounds. The limited work published confirms the starting point of the studies.

Although using UTAUT is seen as most excellent practice in determining user acceptance, however, UTAUT's constructs are still overshadowed by other concepts (Straub & Burton-Jones, 2007) and consequently, it is essential to use the determinants from at least two theories to attain a better understanding in order to further examine behavioural intention toward e-wallet transaction via QR code as criticised by Afshan and Sharif (2016); Oliveira *et al*. (2014); and Oliveira and Martins (2011). Therefore, limitations of the determinants in UTAUT lead this research to integrate determinants of TRI with UTAUT.

In the limitations of UTAUT, the model does not address an individual's willingness to participate in technology. UTAUT does not take into account the psychographic traits of users and many technology-based services cause the technological fears, and it is becoming gradually vital to understand the factors that affect consumer behavioural intention based on consumers' psychological traits. Parasuraman (2000) argues the TRI factors prerequisite to be taken into consideration to predict the use of self-service technologies as it helps to have more accurately predicted the behaviour

of customers. Furthermore, Lim *et al*. (2017) also recommended that personality traits need to be investigated to in order to obtain a better outcome towards the individual's intention. Therefore, there is a necessity to integrate consumer trait that reflects readiness of consumers are willing to use new technologies, including positive and negative feelings about new technology acceptance. Thus, it is more suitable for understanding studies that are most affected by human factors (Kiwanuka, 2015).

Next, one of the biggest limitations of UTAUT is the theory unable to reflect the cultural role in new IT or IS applications. These limitations require further model development for expansion (Madan & Yadav, 2016). Also, UTAUT gives a means of capturing technology acceptance and use of IT in an organisational context (Anderson, Schwager, & L Kerns, 2006; Gupta *et al*., 2019; J. P. Li & Kishore, 2006; Oliveira & Martins, 2011; Reunis, Santema, & Harink, 2006). The limitations associated with UTAUT contain organisational-based and must be improved and adjusted to the consumer environment. Therefore, the research instruments have modified based on the technology being investigated. It focuses mainly on the e-wallet transaction via QR code in Malaysia.

This situation leaves researchers in a "state of methodological vacuum and theoretical confusion" (Benbasat & Barki, 2007). When introducing new IT or IS, it is essential to study the aspects that affect the user intention to use the new technology. Inventors and merchants can use this knowledge throughout the design and implementation process to create a greater quality of technological services (Gao, Krogstie, & Siau, 2011). Thus, this study aims to address the stated limitations by augmenting factors included in TRI into UTAUT in order to extend the existing ones to cater to the research problems.

2.6 Technology Readiness Index Model

Technology Readiness Index (TRI) are the technology adoption model that will attract the most attention from researchers nowadays (Rojas-Méndez, Parasuraman, & Papadopoulos, 2017). Technology Readiness (TR) is well-defined as "people's propensity to embrace and use new technologies for accomplishing goals in home life and at work" (Parasuraman, 2000, p.308). In simple words, TR concept was developed to examine the tendency of a person to accept and try out new technologies in their daily life (Parasuraman, 2000b; Parasuraman & Colby, 2015). At the measurement level, the TRI was established to examine individuals' general beliefs about technology. TRI also measures personality traits of individuals and the readiness of an individual to use of technology. Over a grouping of positive and negative personal technology-related beliefs, it creates a strong predictor of technology-related intentions and behaviour, especially in the field of electronic services (Parasuraman & Colby, 2015).

TRI can indicate both positive and negative measures of consumers' opinions towards technology. According to the investigation of Parasuraman (2000); and Parasuraman and Colby (2015), they agreed that TRI could be catalogued into four sides, namely optimism, innovativeness, discomfort and insecurity. Optimism and innovativeness are the good sides of TR. It can evoke consumers to try out and give good impressions on new products and services. On the other hand, discomfort and insecurity are the opposite; making consumers unwilling to use technology.

Moreover, TRI is also important to examine the potential user who intends to use the technology before its implementation. This model also largely controls the social and psychological factors of a user's technology readiness (Wook, Yusof, & Nazri, 2014). Therefore, the use of TRI in this study is important as it is significant to examine the

technology readiness of individual, which will help the financial institution to design, implementing, and managing the relationship between users and technology.

However, with the rapid advances in the latest technologies in terms of speed, capacity, functionality, connectivity and ease of use, the technology-driven service transformation is likely to accelerate in future while the potentially breakthrough innovations are still nascent. This technology will have a huge impact on service providers, customers and employees (Parasuraman & Colby, 2015). Thus, consumers' personality plays a vital role in embracing new technology. On account of the advancement of technology today, there is an obligation to understand the readiness of consumers to use technology-based systems such as self-service technologies (Parasuraman, 2000b). Thus, according to Parasuraman (2000), TR with multidimensional psychographic constructs provides an approach to segment consumers based on technology beliefs.

Moreover, although TRI is a combination of technology-related beliefs related to positive and negative beliefs, these beliefs are considered as different between the individual (Parasuraman, 2000b). Mutually, these coexisting beliefs will control the predisposition of a person to work together with new technology products and services (Dupree, 2002; Parasuraman & Colby, 2007). More specifically, TRI reveals a set of beliefs about technology but is not an indicator of a person's ability to use it (Walczuch, Lemmink, & Streukens, 2007). Therefore, there are few essential components of technology readiness that need to be considered by the researchers and practitioners which include technology readiness that is different from one individual to another and deemed to be multifaceted where various types of beliefs mix to produce one's overall TR life (Parasuraman, 2000b; Parasuraman & Colby, 2015). Baumgartner (2002)

suggests that users can classify based on characteristic personality profiles because it can provide a strong indication of the options to purchase the various kind of products or services in the market.

Next, given the major changes in the technology prospect and the online financial facilities are becoming more and more popular today, and projects in the Original Technology Readiness Index (TRI 1.0) become less relevant and contain old terms such as machine, computer, and computer program (Parasuraman & Colby, 2015). Consequently, Parasuraman and Colby (2015) initiated the development of an upgraded and modernised technology readiness index known as TRI 2.0 in order to deal with the limitations TRI 1.0 by consider the contemporary technology-related themes for example like smartphones, social media, wireless Internet services, home video conferencing, and cloud applications, to ensure its continued relevance. According to Parasuraman and Colby (2015), it was essential concern to update the TRI 1.0 scale to improve the no longer innovative contexts, study and incorporate the implications for changes in the technological environment and make the more parsimonious. Therefore, this study will use TRI 2.0 to describe how consumers describe the technology at this time.

Last, as by Guhr, Loi, Wiegard and Breitner (2013); Lin and Chang (2011) and; Lin and Hsieh (2012) argued that when assessing customer acceptance level especially in the context of self-service technology, technical readiness cannot be ignored, and Liljander, Gillberg Gummerus and Van Riel, 2006; and Wook *et al*. (2014) argued that there is a need to explore TRI's ability to predict users' acceptance of technology. Therefore, the technology readiness role should be integrated into any technology acceptance models that embrace consumers' acceptance and recruit various self-

service technology (Lin & Hsieh, 2012). This will provide a deeper understanding of customer acceptance of technology-assisted services and provide a unique perspective on the role of technology beliefs in the marketplace.

2.6.1 Constructs of TRI

Parasuraman (2000) developed an index called the Technical Readiness Index (TRI), which proposes four personal characteristics of individuals that influence their technology acceptance decisions, namely innovativeness, optimism, insecurity and discomfort. Moreover, Parasuraman (2000), and Parasuraman and Colby (2015) argued that four of these personal beliefs about acceptance of new technology can create either positive or negative feelings towards technology which will dominate in each individual, where positive drivers, optimism and innovativeness will inspire individuals to accept technology products or services and have a positive attitude toward technology. Negative drivers namely discomfort and insecurity, will hinder the individuals to use technology.

2.6.1.1 Optimism

Optimism is well-defined as "a positive view of technology and a belief that it offers people increased control, flexibility, and efficiency in their lives" (Parasuraman & Colby, 2015, p.60). It marks the general feeling that technology is the items of good and positive. Walczuch, Lemmink and Streukens (2007) also defined optimism as the individual's tendency to believe that technology will help to achieve success.

In general, optimism variable captures particular feelings implying that "technology is a good thing." Optimistic people demonstrate a technology-based constructive perception and conviction themselves to believe it provides more efficiency, control

and agility on a day-to-day basis (Parasuraman, 2000b; Parasuraman & Colby, 2015). An individual who shows optimism in technology tend to use the latest technology and believe that frequent use of technology can give them more control over their own lives and thereby increase their productivity at the workplace.

2.6.1.2 Innovativeness

Innovativeness is the second contributor to technology readiness, and it refers to "a tendency to be a technology pioneer and thought leader" (Parasuraman & Colby, 2015, p.60). Parasuraman and Colby (2011) revealed that it is the tendency of a person's belief that the person will become a niche of technology and thought leader. Erdoğmuş and Esen (2011) see innovation as the first direction of using new technologies.

Agarwal and Prasad (1998) projected a similar construct of personal innovativeness within the IT context, defined as "the willingness of an individual to try out any new information technology" (p. 206). Persons who are high in innovativeness tend to be perceived as technology leaders and pioneers. The study assesses how individuals think they are at the top, using products based on innovative technologies, and being seen by others as opinion leaders on technological matters (Parasuraman & Colby, 2007).

2.6.1.3 Discomfort

Discomfort is one of the inhibitors of technology readiness. Discomfort denotes to "a perceived lack of control over technology and a feeling of being overwhelmed by it" (Parasuraman & Colby, 2015, p.60). It shows the degree of personal disbelief towards technology-based products and services. According to Sophonthummapharn and Tesar (2007), discomfort represents consumers' anxieties when facing technology.

Besides, Guhr, Loi, Wiegard and Breitner (2013) also claim that discomfort indicates an individual's level of general anxiety in applying technology-based products or service. This anxiety and discomfort when using technology may make it impossible for users to use the technology. In addition, users who score uncomfortable scores trust that their technical knowledge is insufficient, thus causing them to be frustrated (Parasuraman, 2000b). While consumers face technological products, highly uncomfortable people may not have enough technical skills because they do not have enough technological skills and feel depressed. Therefore, they may think that technological products are not planned for them, but instead select to evade annoying products. In addition, discomfort may lead to widespread paranoid technology for users.

2.6.1.4 Insecurity

Insecurity is another inhibitor of TRI. It can be defined as "distrust of technology, stemming from scepticism about its ability to work properly and concerns about its potentially harmful consequences" (Parasuraman & Colby, 2015, p.60). Insecurity variable included the cases where the consumer does not trust a technological product and doubts about the product's fulfilling its task (Parasuraman, 2000b).

Although it is a relative discomfort variable, this level is different because it emphasises exact parts of technology-based transactions rather than the absence of satisfaction with general technology (Parasuraman & Colby, 2007). Insecurity feeling may cause doubt, fears, and be sceptical, especially against new technology product or service. Those feelings tend to make consumers avoid technology as they cannot be sure how well their privacy and personal information are protected. Insecurity is considered a belief that users do not want to interact with banking institutions when

the business is completely online. Besides, users do not trust the machine or the Internet to keep or deliver the information appropriately. Thus, constructs of insecurity were developed to measure the level of insecurity and the level of willingness to test their technologies.

2.7 The linkage between TRI and UTAUT

According to Sinha *et al*. (2018), the adoption of new technology can be examined by the intersection extent in the consumer, technology and transaction interface as shown in Figure 2.2 The tripartite conceptualisation is consumer–technology, consumer–transaction, and technology–transaction.

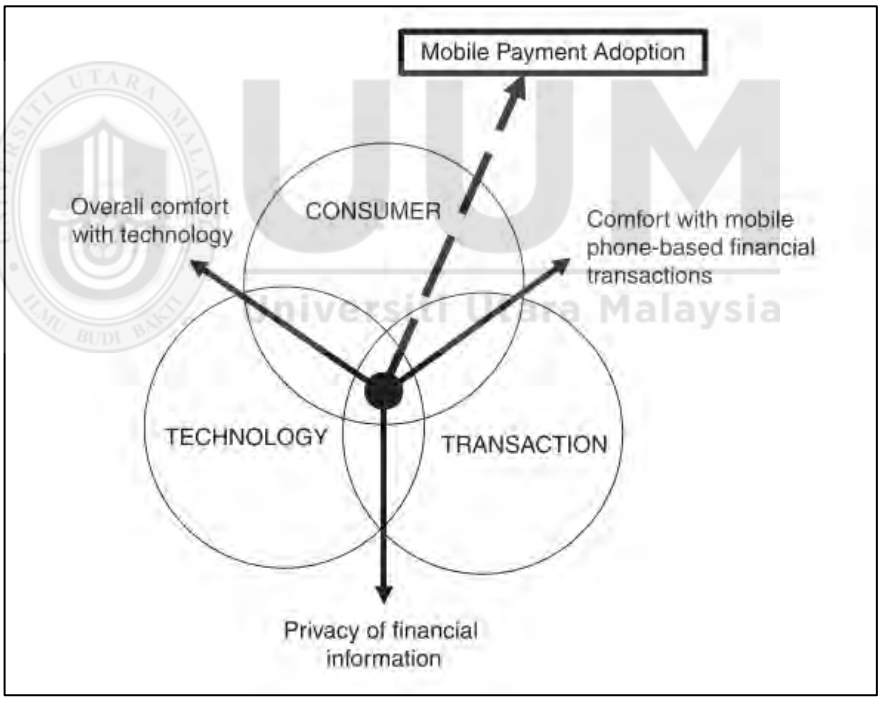


Figure 2. 2: Key Considerations for Mobile Payment Adoption
Source: Sinha *et al*. (2018)

First, the consumer–technology interface denotes to the comfort with technology in general. The consumer–technology interface involves attitudes that are generally rated as best for TR, including comfort or overall discomfort through the use of technologies for work and life (Parasuraman & Colby, 2001). Some technologies are relatively new

to be introduced, some new technologies are successful, and some are not. These rapid technological advancements have changed individual daily routines and his or her habits. But then, there is not enough time for the individual to adjust and use or reject certain technologies that may be deeply rooted in a general attitude toward technology, not just a professional attitude (Sinha *et al*., 2018).

Second, the consumer–transaction interface denotes to the comfort of cashless, counting digital transactions of financial via mobile phones. In particular, it precisely denotes to the use of mobile phones for financial transactions. Frameworks developed in industrialised countries, such as the Technology Acceptance Model (TAM), which reflects the perceived use of simple technologies and technological usefulness (Davis, 1989), has been utilised to study the use of technology. Later, UTAUT was advanced to explain the differences in culture (Venkatesh *et al*., 2003). Though, UTAUT encountered a problem and, based on this, developed a new term called "adoption readiness" (Thakur & Srivastava, 2014).

Third, a technology–transaction interface related to the security or privacy perception of user information in a mobile-based transaction. Previous research, mainly in developed countries, originated that clients were most willing to offer demographic and existence information, but were less willing to provide personal financial information and private identifiers (Dai, Iyer, & Singh, 2007; Vasileiadis, 2014). However, due to changes in trends, it looks that the idea of using a mobile phone for financial transactions can cause privacy and security issues (A., C, A., & C, 2012; Singh *et al*., 2017).

Next, as discussed above, Thakur and Srivastava (2014) define "adoption readiness" as the degree to which people think they are willing to adopt new technologies. The intent to use new products or service needs a certain level of readiness by potential users. Drawing from TAM (Davis, 1989) and UTAUT (Venkatesh *et al*., 2003), literature reveals that "adoption readiness" can be described through perceived ease of use, perceived usefulness, social influence and perceived facilitating conditions, where the evidence in the extant literature revealed that facilitating conditions, performance expectancy, effort expectancy and social influence are actual dimensions of a single construct named "adoption readiness" in the study of Thakur and Srivastava (2014), and Sinha *et al*. (2018).

Besides that, personal characteristics and experience influence user technology decisions (Rogers, 1995; Sinha *et al*., 2018). After consumers participate in joint production, their attitudes help them use technology trends (Bendapudi and Leone, 2003; Curran *et al*., 2003). Various positive and negative responses to technology can coexist (Mick and Fournier, 1998), although their respective dominations may vary from person to person. Therefore, one can unite in the belief of theoretical, technological beliefs, which are very actively docked at one end and very negative at the other end. This variety may be related to their tendency to embrace and use technology (Parasuraman & Colby, 2015).

Technology readiness is there is a tendency to use, grip and use new technology to achieve individual or specialised goals (Parasuraman & Colby, 2019). It mentions to a mind-set as a whole, not an efficiency measure, and an important step in learning market-ready technology, scientific, practical product and service, innovative marketing and technology-intensive, like mobile payment (Sinha *et al*., 2018).

Therefore, the scholar created the technology readiness index (TRI), which comprises of four dimensions, namely optimism, innovation, discomfort and insecurity.

TRI measures a variety of positive and negative attitudes toward technologies. High TR produces self-efficacy for the use of technology (Venkatesh, Davis, & Morris, 2007) and more powerful control-related technological tasks (Kang, Heo, & Kim, 2011), leading to increased views on the use of technology and ease of use (Gefen, Karahanna, & Straub, 2003). Furthermore, Parasuraman and Colby (2001) discovered that different customer groups with different TR profiles are very different from Internet-related behaviours. Yen (2005) said that part of users is correspondingly willing to accept technology support services. So, when evaluating SST customer acceptance, TR cannot be ignored because it shows an important role in generating technological perceptions and behaviour (Lin & Hsieh, 2006).

Also, customers incline to assess customer service interfaces depend on their TR, which in turn affects their service of cognitive experience (Zou *et al*., 2016). Though, if users' information, beliefs and prior experience fix whether they believe the technology is useful for their lives and work (Parasuraman & Colby, 2001b), their TR may influence their tendency to assume any technology, creating it necessary for technological use in the premise model (Sinha *et al*., 2018). According to Chien-Hsin Lin, Hsin-Yu Shih, Sher and Yen-Li Wang (2005), and Godoe and Johansen (2012), the merge of general personality dimensions with system-specific dimensions represents the latest contribution in describing how personality dimensions affect how people interact, experience and use new technologies.

In the study of Chien-Hsin Lin *et al*. (2005), TR was used as a predictor of TAM. Nevertheless, in a more recent study, factors containing TR have been connected directly to the variable of UTAUT, namely performance expectancy (also known as perceived usefulness in TAM), and effort expectancy (also known as perceived ease of use in TAM), facilitating conditions and social influence as stated in the discussion above. Optimism and innovativeness are designed to achieve higher effort expectations and business expectations while acclaiming insecurity and inconvenience to prevent such changes.

Follow the model recommended by Walczuch *et al*. (2007), TRI's personality dimension is an antecedent to the TAM cognitive dimension. The personality dimensions of TRI will influence the beliefs and perception's variables toward the behavioural intention to use innovative technology. Furthermore, segmentation and target markets cannot be accurately recognised and particular in a marketing environment solely through a technology acceptance model, as it is sometimes impractical to do so before they decide to adopt a consumer try out systems. Therefore, TR construct can be used as the basis for market segments.

In addition, the proposed model can explain why people who are high on TR does not always use high-tech products available on the market because of the beliefs or perception toward system-related characteristics (Lin, Shih, & Sher, 2007), including effort expectancy, performance expectancy, facilitating condition and social influence that dominate the decision-making process of behavioural intention. In particular, according to Diffusion theory (Rogers, 1995), culture and communication patterns use to affect diffusion processes. Asian countries, where risk avoidance is high, only once consumers become aware that others have tried the technology, they follow suit

quickly so as not to be left behind (Keegan & Green, 2014). Overall, the integrated model significantly enhances the ability to interpret the construct of TRI and UTAUT in a marketing environment.

Besides that, in TRAM, TAM's perceived usefulness and perceived ease measurements are specific to a particular system (system-specific), while TRI is used for general technology beliefs (individual-specific); intuitively, TR and TAM are interrelated. When faced with the selecting option, the consumers usually starts an internal search and checks the memory for available information (Ross & Bettman, 1979). Most people have used technology before evaluating a particular e-service system, so in addition to the characteristics of an objective system, the general beliefs about technology (from similar experience) can be used for anchoring ease of use and perceptions of usefulness.

This phenomenon tends to be more distinct when people have no specific experience with a particular system (Venkatesh & Davis, 1996) because new users use alternative general criteria (compared to more specific criteria) to handle alternatives more precisely (Bettman & Sujan, 1987; Lin *et al*., 2007). Therefore, it seems that the theoretical and practical foundations implicitly assume that when people evaluate the intent of technology adoption, they collect and process TR cognitive information before recalling and dealing with specific cognitive appraisal such facilitating condition, performance expectancy, social influence and effort expectancy.

Specifically, TR is the main antecedent for the perceived usefulness and perceived ease of use, which in turn affects the consumer's intention to use e-services. TR is generally considered to be a causal determinant of specific cognitive appraisal of

usefulness and ease of use of innovative technology (Chien-Hsin Lin *et al*., 2005). In theory, research has shown that previous product experience and knowledge can affect consumer cue utilisation and message processing in product evaluation (Peracchio & Tybout, 1996; Rao & Monroe, 1988). Users with additional product knowledge can find more information before solving problems because they understand existing attributes and can find relevant information (Alba & Hutchinson, 1987; Brucks, 1985). More knowledge replicates a broader range of knowledge, complexity, experience, expertise, and common sense, so process information related to questions and conclusions about product feature assessment can be expected with people with more knowledge (Alba & Hutchinson, 1987; Peracchio & Tybout, 1996). Moreover, consumers' expectations, based on previous beliefs deposited in memory, can affect the user's perception of marketing information (Ross & Bettman, 1979). The prior beliefs formed through experience show a vital role in controlling the processing of information and leading behaviour (John, Scott, & Bettman, 1986).

In the context of research, people with experience in knowledge or information technology have formed the self-efficacy of technology which influences future performance (Gist & Mitchell, 1992; Gist, 1987; Venkatesh & Davis, 1996). The study of innovation diffusion also shows that past innovation experiences are needed to build knowledge of the importance of trust formation (Rogers, 1995). Based on experience, the experience gained through previous technology uses to improve consumer perception of technology and the consumer's online behavioural intention (Gefen, 2003; Karahanna *et al*., 1999; Yoh, Damhorst, Sapp, & Laczniak, 2003). The underlying relationship between computer self-efficacy and usefulness perceptions and ease of use has been validated (Venkatesh & Davis, 1996). The positive

relationship between previously established beliefs about e-service beliefs in the field of e-services has also received empirical support (Yoh *et al*., 2003).

Furthermore, some foreign countries' studies have shown that the influence of TR on the intentions to use may be indirect. For instance, in Taiwan's e-service research, the influence of TR on perceived usefulness and ease of use are both positive and correlated, both of which are important links in the construction of TAM (Lin & Hsieh, 2007). One more study in India established a situation in the context of mobile commerce adoption (Roy & Moorthi, 2017). Though, the concept of "adoption readiness" examined later consist of two supplementary dimensions as opposed to TAM, namely facilitating conditions and social influence. Conferring to Sinha *et al*. (2018), a high TR will raise confidence and openness towards suggestions from others who are important to them to use the technology. This displays the effect of TR on social impact. Likewise, the high TR will provide more knowledge and confidence for one's ability to understand and use the help provided, making this case a TR on facilitating conditions. This showed a linkage between TRI and UTAUT. However, according to past studies, the linkage between TRI and UTAUT for behavioural intention to use e-wallet transaction via QR code is yet to be made.

In conclusion, after the discussion of eleven theories, this study will employ two main theories which are The Unified Theory of Acceptance and Use of Technology (UTAUT) and Technology Readiness Index (TRI) to support the framework of this study.

2.8 Related Studies – Determinants of Technology Acceptance

Several determinants have been explored through the literature of technology acceptance. This section will discuss the antecedents of the determinants of behavioural intention, namely performance expectancy, effort expectancy, facilitating conditions, and social influence from previously studied contexts in the literature review of the technology acceptance. In addition, the researcher will discuss the relationships in detail.

2.8.1 Determinants of Behavioural Intention

Behavioural intention is "a measure of the strength of one's intention to perform a specified behaviour" (Davis, 1989, p. 984). In this study, the following paragraphs are focusing on the impact of eight antecedents on behavioural intention, namely facilitating conditions, effort expectancy, performance expectancy, social influence, optimism, innovativeness, discomfort and insecurity.

2.8.1.1 The relationship between optimism and behavioural intention

The new technologies acceptance contains a complex system of beliefs. The system is bonded with four constructs in technology readiness which include innovativeness, optimism, insecurity and discomfort. Four of these beliefs are different among individuals (Parasuraman, 2000a). Optimistic people demonstrate a technology-based constructive perspective and believe it offers individuals with greater efficiency, control and agility on daily issues (Parasuraman & Colby, 2007). Optimistic tend to use the latest technology and believe greater use of technology can make people have better control over their own lives and thus work more efficiently.

Researchers have found that technology readiness played an important role in the behavioural intention to use technology, and there was a positive and significant relationship between technology readiness and behavioural intention (BasGöze, 2015; El Alfy *et al*., 2017; Guhr *et al*., 2013; Lin & Chang, 2011; Sinha *et al*., 2018). More specifically, Schaupp, Carter and McBride (2010) used to test the optimism bias toward the intention to use Internal Revenue Service endorsed the e-file system. Just as the United States Congress has set the determined goal of transmitting e-government initiatives. A total of 260 respondents who had submitted income tax to the Internal Revenue Service were studied. The results show that the optimism bias has a significant positive influence on the intentions of using Internal Revenue Service endorsed the e-file system that supports electronic filing systems. They found that optimism bias will increases use intentions.

On the other hand, in the study of Rojas-Méndez, Parasuraman and Papadopoulos (2017), optimism was found to have an insignificant relationship in the differences between genders, but have a significant relationship in the differences between age and education in the USA and Chile. However, in the study of Sinha *et al*. (2018), they used to investigate the consumers' intention in India to make use of mobile payments by examining their Technology Readiness (TR) by integrating the construct of optimism, innovativeness, insecurity and discomfort toward the intention to adopt. In the study, their result shows that there is a significant positive relationship between TR and intention to adopt mobile payment.

After reviewing the literature, as shown in Table 2.3, there are very few studies that have explored the role of the construct "optimism" in technology readiness and their relationship toward the behavioural intention. In the field of e-wallet transaction via

QR code, the relationship between optimism and behavioural intention has not received any attention from researchers, and it is a need to figure out this relationship in this domain.

2.8.1.2 The relationship between innovativeness and behavioural intention

Innovativeness depends on individuals and is seen to be a critical element in consumers' technology acceptance (Pattansheti *et al*., 2016). In particular, Agarwal and Prasad (1998) suggested that perceived innovativeness as a concept in the IT settings, and well-defined it as "the willingness of an individual to try out any new information technology" (p.206). Also, Rogers (1995) argued that a person with a high level of innovativeness triggers early adoption of new technology and idea.

Resulting in this method, different authors have gained empirical evidence supporting the impact of user innovativeness in the domain of different technologies such as mobile payment (Thakur & Srivastava, 2014), online purchase (Martín & Herrero, 2012), online tickets (Escobar-Rodríguez & Carvajal-Trujillo, 2014) and technology-based products and services (Rojas-Méndez *et al*., 2017). For instance, in the study of Thakur and Srivastava (2014), they found that personal innovation has had a major and positive impact on the intentional use of mobile payments to purchase good and service in India. Also, Rojas-Méndez *et al*. (2017) and Martín and Herrero (2012) also prove that there is a relationship between innovativeness and behavioural intention toward new technology. However, there are still some of the studies indicated an insignificant relationship (Casey & Wilson-Evered, 2012; Dimitriadis & Kyrezis, 2010).

In some, the result is inconsistent in the past study where former found to have no significant relationship, but the latter study found to have a relationship. Therefore, after reviewing the literature as shown in Table 2.3, it can be concluded that the relationship between innovativeness and behavioural intention received minimal attention from researchers, and they found that persons who have a higher level of innovativeness are expected to accept new technology. It will be more interesting if this study could further investigate this relationship in e-wallet transaction via QR code in Malaysia.

2.8.1.3 The relationship between discomfort and behavioural intention

As revealed earlier, the consumer's personality traits may affect the acceptance of customer self-service technologies. The study of Guhr, Loi, Wiegard and Breitner (2013) revealed that discomfort is a degree to which an individual has general anxiety when accepting technology-based product or services. The personal disbelief in technology-based products and services may prevent the consumer from adopting the technology. It denotes that the individual will assume that the individuals are limited to some persons rather than inclusive of all (Parasuraman & Colby, 2007).

Nevertheless, there is a lack of studies used to examine the relationship between discomfort and behavioural intention. For instance, only Seol, Ko and Yeo, (2017) examine the positive technology readiness and negative technology readiness toward the behavioural intention. They had investigated the relationships between the significant control factors on acceptance intention to user experience sports smart wearable devices by applying TR and UTAUT. Total of 534 users of smart golf devices in Seoul was examined by collecting questionnaires. The software of SPSS and AMOS were used as the methods to analyse the collected data. So far, their study

found that the relationship between positive and negative technology readiness have insignificant relationship toward the behavioural intention. In contrast, the study of Rojas-Méndez, Parasuraman and Papadopoulos, (2017) found that discomfort has a negative influence on behavioural toward technology.

After a review of the literature, as shown in Table 2.3, the relationship received very little attention in the prior studies. Moreover, in the domain of e-wallet transaction via QR code, there is a needed to measure customers' anxiety in coping with technologically based services. The negative belief of an individual such as discomfort will use to ensure the success of the technology as discomfort will negatively influence the behavioural intention to use the technology (Parasuraman, 2000a; Parasuraman & Colby, 2015).

2.8.1.4 The relationship between insecurity and behavioural intention

Insecurity covers consumers' distrust of technology products and suspicion of product fulfilment through their work (Parasuraman, 2000a). Perceived risk is very similar to the insecurity in the TR concept (Siu & Chang, 2015). Perceived risk is feeling insecure about technology. It can be referred to as performance, product, financial, social, time, physical or psychological risk when consumers conduct their transaction (Oluoch, Abaja, W.Mwangi, & Githeko, 2015). Those vulnerabilities such as security and privacy problem will be the recurring issues to adopt banking technology (Debasish & Dey, 2015; Faniran & Odumeru, 2015; Ismail & Masinge, 2011; Njenga & Salih, 2019; Oluoch *et al*., 2015; Rahi & Ghani, 2018).

For instance, Hanafizadeh, Behboudi, Koshksaray and Tabar (2014) conduct a study to investigate the significance of the antecedents of intention to use mobile banking

based on 361 university students in Iran. The results indicated that there was a negative and significant relationship between perceived risk and behavioural intention to use mobile banking. The finding was further supported by Tan and Lau, (2016) who revealed that perceived risk would negatively influence the behavioural intention of Generation-Y to use mobile banking in Malaysia.

Also, a study conducted by Thakur and Srivastava (2014) in India, they found that perceived risk showed there is a significant negative impact on the customer's intention to use mobile payments to buy goods and services. However, the finding is not supported by Karma, Ibrahim and Ali (2014). Thus, Thakur and Srivastava (2014) revealed that the findings might differ from other personal variables such as national background, service offerings, regulatory frameworks and lifestyles, and they further demonstrate that this is a future research opportunity to justify this relationship.

After reviewed the literature, as shown in Table 2.3, although there is a mixed result were found in the relationship between perceived risk and behavioural intention. However, some researchers provided an evident that perceived security will influence the behavioural intention to use technology (Chiu *et al*., 2017; Susanto, Lee, Zo, & Ciganek, 2013). However, there is almost a lack of studies used to investigate the relationship between insecurity and behavioural intention to use e-wallet transaction via QR code in Malaysia.

2.8.1.5 The relationship between performance expectancy and behavioural intention

Performance expectancy is one of the fundamental constructs of UTAUT. Performance expectancy is well-defined as the perception to which using technology

offers benefits to a person when carrying out certain activities (Venkatesh *et al*., 2003). In addition, performance expectancy has been proven as an antecedent of behavioural intention in UTAUT (Venkatesh *et al*., 2003). Moreover, performance expectancy posed as a relevant predictor, derived from the perceived usefulness introduced in the original TAM model (Kim & Park, 2012).

Performance expectancy has been used in different research contexts to study behaviour intention. The context including WeChat mobile payment innovation (Larasati *et al*., 2018), e-invoicing (Olaleye & Sanusi, 2019), sport smart wearable devices (Seol *et al*., 2017), e-learning system (Salloum, 2019), mobile and distance learning (Isaias *et al*., 2017), internet banking (Al-Queisi, Dennis, Alamanos, & Jayawardhena, 2014; Tarhini *et al*., 2016), mobile payment (Abrahão *et al*., 2016; Teo *et al*., 2015), mobile banking (Faria, 2013; Owusu Kwateng *et al*., 2019; Raza *et al*., 2018; Tan & Lau, 2016), and technology of animation and storytelling (Suki & Suki, 2017).

Based on the study of Agustin and Mulyani (2018), the study aimed to find empirical evidence that UTAUT model is a conceptual framework to describe the acceptance of e-learning system in accounting lecturers of state and private universities in Padang, Indonesia. The sample of this study was 66 lecturers of state and private university in Padang that already implemented e-learning system. The data were obtained by distributing questionnaires directly to accounting lecturers on their respective universities. The data were analysed using Partial Least Square (PLS). The study finds the empirical evidence that UTAUT model can empirically prove the positive role of performance expectancy, effort expectancy, social influence, and facilitating

conditions in improving the intention of accounting lecturers of state and private universities in Padang to use e-learning system.

According to the study of Hoque and Sorwar (2017), they have provided an integrated model that examines the determinants of behavioural intention to use mobile health in Bangladesh. The study determined that performance expectancy had a significant impact on the users' behavioural intention to adopt mobile health services. In addition, in the context of mobile banking, the results in most of the studies as revealed that performance expectancy in UTAUT or perceived usefulness in TAM was significantly and positively influencing behavioural intention to use a technology (Agustin & Mulyani, 2018; Farah *et al*., 2018; Faria, 2013; Naranjo-Zolotov *et al*., 2018; Raza *et al*., 2018; Salloum, 2019; Tan & Lau, 2016; Thongsri, Shen, Bao, & Alharbi, 2018) with the exception of some of the studies based on UTAUT (Afshan & Sharif, 2016; Gupta *et al*., 2019; Olaleye & Sanusi, 2019; Oliveira *et al*., 2014; Shaw & Sergueeva, 2019), and significant relationship in TAM (Gu *et al*., 2009; Hanafizadeh *et al*., 2014; Kongarchapatara, 2018; Tobbin, 2012; Veríssimo, 2016).

On the other hand, in the domain of mobile payment, Larasati, Havidz, Kefan, Aima and Ali (2018) proved that the relationship between performance expectancy and behavioural intention to use WeChat mobile payment innovation in India are positive insignificant. Furthermore, Oliveira *et al*. (2014), Njenga and Salih (2019), Owusu Kwateng, Osei Atiemo and Appiah (2019) and Farah, Hasni and Abbas (2018) also found an insignificant relationship between performance expectancy and behavioural intention, but in the different technology context.

Based on the literature reviewed in Table 2.3, it is evident that the relationship between performance expectancy and behavioural intention is inconsistent because some researchers found the relationship is either significant or insignificant. Besides, this relationship also has received a large amount of attention from researchers, as shown in Table 2.3. However, there is a lack of empirical study focus on this relationship in the context of e-wallet transaction via QR code in Malaysia.

2.8.1.6 The relationship between effort expectancy and behavioural intention

In UTAUT, effort expectancy is one of the determinants that predict the intention to use technology. Effort expectancy is derived from the perceived ease of use introduced in the original TAM model (Kim & Park, 2012). Effort expectancy denotes the perception of ease related to the use of technology of individual users (Venkatesh *et al*., 2003). When process-oriented issues are at the forefront of users' minds, effort expectancy can be the key factor, perhaps even more important than performance expectancy of IS (Venkatesh & Davis, 2000).

In the past studies, there is an extensive of empirical studies in different settings have examined the relationship between effort expectancy and the intention to use technology (Abrahão, Moriguchi, & Andrade, 2016; Afshan & Sharif, 2016; Agustin & Mulyani, 2018; Akhtar, Irfan, Sarwar, Asma, & Rashid, 2019; Alaiad & Zhou, 2013; Awwad & Al-Majali, 2015; Casey & Wilson-Evered, 2012; Cimperman *et al*., 2016; Escobar-Rodríguez & Carvajal-Trujillo, 2014; Farah, Hasni, & Abbas, 2018; Faria, 2013; Gupta *et al*., 2019; R. Hoque & Sorwar, 2017; Hsu *et al*., 2017; Isaias *et al*., 2017; Khalilzadeh *et al*., 2017; Larasati *et al*., 2018; Naranjo-Zolotov *et al*., 2018; Olaleye & Sanusi, 2019; Oliveira *et al*., 2014; Rahi & Ghani, 2018; Rahi *et al*., 2018; Raza *et al*., 2018; Salloum, 2019; Seol *et al*., 2017; Shaw & Sergueeva, 2019; Singeh

et al., 2013; Suki & Suki, 2017; Tan & Lau, 2016; Tarhini *et al*., 2016; Teo *et al*., 2015; Zuiderwijk *et al*., 2015). Except some of the studies (Afshan & Sharif, 2016; Faria, 2013; Isaias *et al*., 2017; Larasati *et al*., 2018; Naranjo-Zolotov *et al*., 2018; Olaleye & Sanusi, 2019; Oliveira *et al*., 2014; Owusu Kwateng *et al*., 2019; Salloum, 2019; Schaupp *et al*., 2010; Singeh *et al*., 2013; Tarhini *et al*., 2016), the results in most of the studies revealed that effort expectancy was significantly and positively influencing behavioural intention in different technology setting.

For instance, Raza *et al*. (2018) investigate the factors which influence mobile banking (M-banking) acceptance in Islamic banks of Pakistan by employing the UTAUT model. The effort expectancy, perceived value, facilitating conditions, performance expectancy, social influence, habit and hedonic motivation are taken as independent variables. Obviously, this study will support Islamic banks in improving mobile banking growth and decision-makers in making those strategies that boost the acceptance of mobile banking in the country.

Other than that, in Malaysia, effort expectancy act as an essential factor in predicting behavioural intention to use technology. Tan and Lau (2016) discovered that effort expectancy is a significant factor in predicting behavioural intention. They are studying the behavioural intention to use in Malaysia base on UTAUT, wherein the context of mobile banking services among Y-generations was investigated. This paper examines the responses of the generation Y consumer subgroup, namely college students, and the authors prove that the effort expectancy is a strong predictor for behavioural intention to use mobile banking. Moreover, this relationship has also been proven in TAM in the other technology settings (Akhtar *et al*., 2019; Gu, Lee, & Suh,

2009; Hanafizadeh, Behboudi, Abedini Koshksaray, & Jalilvand Shirkhani Tabar, 2014; Karma, Ibrahim, & Ali, 2014; Kongarchapatara, 2018).

However, there are still numerous past studies found that the insignificant impact of effort expectancy toward behavioural intention to use different technologies by using UTAUT (Afshan & Sharif, 2016; Faria, 2013; Naranjo-Zolotov *et al*., 2018; Oliveira *et al*., 2014; Owusu Kwateng *et al*., 2019; Salloum, 2019). For instance, the finding of Larasati *et al*. (2018) were startled authors because the research result indicates that effort expectancy has insignificant positive relationship toward behavioural intention to adopt WeChat mobile payment innovation toward Indonesia citizenship based in China.

In short, the literature review in Table 2.3 showed the evidence where the relationship between effort expectancy and behavioural intention to use received numerous attentions from the previous researcher. However, the results are highly inconsistent, and there is a lack of studies focus on the e-wallet transaction via QR code setting in Malaysia.

2.8.1.7 The relationship between facilitating conditions and behavioural intention

Facilitating conditions denotes individual users' perceptions towards the availability of support and resources to perform a behaviour, and it is an external control that can play an essential role in the early phases of users' experience with a system (Venkatesh & Davis, 2000; Venkatesh, Morris, Davis, & Davis, 2003). In UTAUT theory, facilitating conditions showed the effect on "use behaviour" factor not on the "behavioural intention". However, facilitating conditions is derived from perceived behavioural control in TPB (Taylor & Todd, 1995), and is used as an antecedent of the

behavioural intention of several past studies (Afshan & Sharif, 2016; Agustin & Mulyani, 2018; Alaiad & Zhou, 2013; Cimperman *et al*., 2016; Escobar-Rodríguez & Carvajal-Trujillo, 2014; R. Hoque & Sorwar, 2017; Isaias, Reis, Coutinho, & Lencastre, 2017; Khalilzadeh *et al*., 2017; Martín & Herrero, 2012; Naranjo-Zolotov *et al*., 2018; Olaleye & Sanusi, 2019; Rahi *et al*., 2018; Rana, Dwivedi, Williams, & Weerakkody, 2016; Suki & Suki, 2017; Tarhini *et al*., 2016).

Although there as several studies indicate the relationship between facilitating conditions and behavioural intention, but their studies are tested in different technological contexts such as WeChat mobile payment innovation (Larasati, Havidz, Kefan, Aima, & Ali, 2018), mobile banking (Owusu Kwateng *et al*., 2019), healthcare robots (Alaiad & Zhou, 2013), mobile commerce (Shaw & Sergueeva, 2019), home telehealth services (Cimperman *et al*., 2016), online tickets (Escobar-Rodríguez & Carvajal-Trujillo, 2014), e-invoicing (Olaleye & Sanusi, 2019), mobile health (R. Hoque & Sorwar, 2017), e-book (Hsu *et al*., 2017), NFC (Khalilzadeh *et al*., 2017), mobile payment (Teo *et al*., 2015), e-participation (Naranjo-Zolotov *et al*., 2018), internet banking (Tarhini *et al*., 2016), mobile banking (Teo *et al*., 2015), open data technologies (Zuiderwijk *et al*., 2015), and many more.

For instance, Larasati, Havidz, Kefan, Aima and Ali (2018) have investigated the relationship between facilitating conditions and behavioural intention in the context of WeChat mobile payment innovation. In the study, there are total four independent variables, namely performance expectancy, effort expectancy, social influence, and facilitating conditions, and one dependent variable, namely behavioural intention to adopt WeChat mobile payment proposed in the research model. The study objective is Indonesia citizenship that resides in China, and the finding signified a significant

positive relationship on facilitating conditions to behavioural intention to adopt WeChat mobile payment. However, performance expectancy, effort expectancy and social influence signified an insignificant positive relationship toward behavioural intention to adopt WeChat mobile payment innovation.

Besides that, as mentioned by Shaw and Sergueeva (2019), users can carry mobile commerce through their smart devices. They can look at the needed products and service. When they are ready, they will make a payment, and the products will be delivered to their home. By giving their personal information, they can get faster, more personalised services. Because of the hazard of losing privacy, users required to balance their privacy issues with the value of enhanced mobile transactions. In their research, UTAUT2 was adapted, where the value was considered to swap the value of the price to convey the value of the IT artefacts that had no direct cost attributable to it. From an empirical study of 287 Canadian smartphone owners, the results show that effort expectancy, perceived value, habit, hedonic motivation significant influence intention to use mobile commerce, while the social influence and facilitating conditions were found to have an insignificant effect on behavioural intention.

Next, in the context of healthcare robots, Alaiad and Zhou, (2013) discovered that there was a significant and a direct relationship between facilitating conditions toward behavioural intention among patients' behavioural intention to use healthcare robots. Furthermore, Hsu, Lin, Chen, Chang and Hsieh, (2017) examined the relationship in the context of the e-book in Taiwan, and they found that there is a significant relationship between facilitating conditions and intention to use e-books. Also, they confirmed in the study using UTAUT. The findings from other studies also confirmed the significance of the relationship between facilitating condition and behavioural

intention in other technological domain (Agustin & Mulyani, 2018; Cimperman *et al*., 2016; Escobar-Rodríguez & Carvajal-Trujillo, 2014; Naranjo-Zolotov *et al*., 2018; Olaleye & Sanusi, 2019; Rahi *et al*., 2018; Suki & Suki, 2017; Tarhini *et al*., 2016; Teo *et al*., 2015).

Yet, Hoque and Sorwar, (2017) who investigate the individuals in the city of Bangladesh, and they revealed that there is no significant relationship between the facilitating condition and the users' behavioural intention to use the mobile health services. Furthermore, Singeh, Abrizah and Karim, (2013) who have examined this relationship in Malaysia in the self-achieve in their institutional repository was also found to have no significant relationship. In other settings, it was also found to have no relationship between the facilitating condition and behavioural intention as well (Gupta *et al*., 2019; Isaias *et al*., 2017; Khalilzadeh *et al*., 2017; Martín & Herrero, 2012; Owusu Kwateng *et al*., 2019; Schaupp, Carter, & McBride, 2010).

Nevertheless, most of the results in the past studies indicated that facilitating conditions have a positive influence on behavioural intention to adopt several technology contexts, and it is found to play a vital part in determining the behavioural intention. But there is a lack of the past study as far in e-wallet transaction via QR code context that investigated the relationship between facilitating conditions and behavioural intention.

After reviewing the literature in Table 2.3, it is evident that the relationship between facilitating conditions and behavioural intention is highly inconsistent because they found the relationship is either highly significant or insignificant. It also received not

much attention from the past researchers and little attention in the domain of e-wallet transaction via QR code in Malaysia.

2.8.1.7 The relationship between social influence and behavioural intention

Social influence is the extent to which technology users perceive the importance of others believe that they should use the technology (Venkatesh *et al*., 2003). More explicitly, in UTAUT, social influence is one of the key constructs to influence the behavioural intention to use technology. This relationship is recognised and confirmed by Venkatesh *et al*. (2003).

The quick growth of the mobile phone in the country of Asian has augmented the request for mobile banking in financial services and mobile transactions. Akhtar, Irfan, Sarwar, Asma and Rashid (2019) showed empirical research on mobile banking in China and Pakistan. In TAM, the factor of social influence was to investigate the direct impact of personal intention. An empirical study was conducted, and the data was obtained from both countries. Numerous regression analysis and hierarchy were performed by using IBM SPSS software to test the projected hypotheses. Based on these findings, they have seen the use of perceived usefulness, social influence, and perceived ease of use as the important indicators of a person's intention to adopt the mobile banking in Pakistan, and its use is considered an important indicator of China. Though, social influence has had an unimportant impact on the individual's intention to adopt mobile banking in China.

Besides that, Farah, Hasni and Abbas (2018) used to check for vital factors that aid clarify consumer intention and use behavioural of mobile banking practices. Convenience sampling techniques make it easy to gather data from a sample of 490

respondents in Pakistan. Data were analysed using SPSS and AMOS for Cronbach's alpha, composite reliability, common variance, Harmon's single-factor test, AVE, correlation and structural equation modelling. The results suggest that predictors of intention, including performance expectancy, effort expectancy, social influence, perceived value, habit, hedonic motivation (excluding for facilitating condition), perceived risk and trust, are significant in the study.

Beside, Isaias *et al*. (2017) had investigated the relationship between all of the UTAUT constructs in mobile and distance learning among 79 universities students in Portugal. In their study, their goal is to solve the problem of lack of face-to-face communication through effective technology and empathy systems in distance education. However, they only found that the constructs of social influence had a positive impact on the students' behavioural intention to use emphatic forums.

Besides, in the example of in other technological settings, some of the studies showed that social influence or subjective norm is an essential factor for predicting behavioural intention (Agustin & Mulyani, 2018; Akhtar *et al*., 2019; Farah *et al*., 2018; Gupta *et al*., 2019; Njenga & Salih, 2019; Olaleye & Sanusi, 2019; Pattansheti, Kamble, Dhume, & Raut, 2016; Rahi *et al*., 2018; Salloum, 2019; Tan & Lau, 2016). However, there are several past studies showed an insignificant relationship (Afshan & Sharif, 2016; Faria, 2013; Larasati *et al*., 2018; Naranjo-Zolotov *et al*., 2018; Oliveira *et al*., 2014; Owusu Kwateng *et al*., 2019; Raza *et al*., 2018; Shaw & Sergueeva, 2019; S. Singh & Srivastava, 2018; Thongsri *et al*., 2018).

After reviewing the literature, as shown in Table 2.3, it can be assumed that the relationship between social influence and behavioural intention received not much

attention from researchers. In the context of e-wallet transaction via QR code, there is a lack of the previous study to prove this relationship. Therefore, the researcher argued and expected social influence would contribute positively toward the influence of e-wallet transaction via QR code in Malaysia.

Table 2. 3
Some of the Previous Studies Investigating the Antecedents of Behavioural Intention

Studies	**Subjects**	**Theory/ Model**	**Technology**	**Proposed Antecedents of Behavioural Intention**	**Findings *Significant, #Insignificant**
Al-Queisi, Dennis, Alamanos and Jayawardhena, (2014)	216 users of banking services in the UK	UTAUT	Internet banking	Performance expectancy Web Design Quality (including Technical Quality, General Content Quality, Special Content Quality, Appearance Quality)	Performance Expectancy → Usage Intention* Web Design Quality → Usage Intention*
Akhtar, Irfan, Sarwar, Asma and Rashid (2019)	278 Pakistani respondents and 311 Chinese respondents	TAM	Mobile Banking	Perceived Ease of Use adopt# Perceived Usefulness Social Influence	**Pakistan** Perceived Ease of Use → Individuals' intention to adopt* Perceived Usefulness → Individuals' intention to adopt* Social Influence → Individuals' intention to adopt* **China** Perceived Ease of Use → Individuals' intention to adopt# Perceived Usefulness → Individuals' intention to adopt# Social Influence → Individuals' intention to adopt*
Agustin and Mulyani (2018)	66 lecturers of state and private university in Padang, Indonesia	UTAUT	E-learning	Effort Expectancy Performance Expectancy Social Influence Facilitating Conditions	Effort Expectancy → Intention to Use* Performance Expectancy → Intention to Use* Social Influence → Intention to Use* Facilitating Conditions → Intention to Use*

Abrahão, Moriguchi and Andrade, (2016)	Brazilian mobile telephony consumers	UTAUT	Mobile payment	Performance expectation Effort expectation Social influence Perceived risk Perceived cost	Performance expectation → Behavioural Intention* Effort expectation → Behavioural Intention* Social influence → Behavioural Intention* Perceived risk (-) → Behavioural Intention* Perceived cost → Behavioural Intention*
Afshan and Sharif, (2016)	198 higher education students in Pakistan	Task-Technology Fit Model (TTF), ITM, and UTAUT	Mobile Banking	Task-Technology Fit Trust Performance Expectancy Effort Expectancy Social Influence Facilitating Condition	Task-Technology Fit → Intention* Trust → Intention* Performance Expectancy → Intention# Effort Expectancy → Intention# Social Influence → Intention# Facilitating Conditions → Intention*
Awwad and Al-Majali, (2015)	575 universities students in Jordan	UTAUT	Electronic library services	Performance Expectancy Effort Expectancy Social Influence	Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention* Social Influence → Behavioural Intention*
Akhlaq and Ahmed, (2013)	109 individuals Pakistan	Motivational model (MM), and TAM	Internet banking	Trust	Trust → Intention*
Alaiad and Zhou, (2013)	50 patients in the US	UTAUT	Healthcare robots	Performance Expectancy Effort Expectancy Social Influence Facilitating Conditions Trust	Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention*

					Social Influence → Behavioural Intention* Facilitating Conditions → Behavioural Intention* Trust → Behavioural Intention*
BasGöze, (2015)	345 smartphone users in Turkey	TAM and TR	Mobile Shopping	Technology Readiness Perceived Ease of Use Perceived Usefulness	Technology Readiness → Behavioural Intention* Perceived Ease of Use → Behavioural intention# Perceived Usefulness → Behavioural Intention*
Casey and Wilson-Evered (2012)	127 staff in Australia	UTAUT	Online family dispute resolution services	Performance Expectancy Effort Expectancy Social Influence Trust in the Organization Trust in Technology Web Innovativeness	Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention* Social Influence → Behavioural Intention# Trust in the Organization → Behavioural Intention# Trust in Technology → Behavioural Intention# Web Innovativeness → Behavioural Intention#

Carter, Christian Shaupp, Hobbs and Campbell, (2011)	304 US taxpayers in the US	UTAUT	Online tax filing	Effort Expectancy Performance Expectancy Social Influence Trust of Independent Intermediary Web Self Efficacy Perceived Security Control	**Acceptance Factors** Effort Expectancy → Intention to Use* Performance Expectancy → Intention to Use* Social Influence → Intention to Use* **Personal Factors** Trust of Independent Intermediary→ Intention to Use* Web Self-Efficacy → Intention to Use* Perceived Security Control→ Intention to Use*
Cimperman, Makovec Brenčič and Trkman (2016)	400 participants aged 50 years and above in Slovenia	UTAUT	Home telehealth services	Performance Expectancy Effort Expectancy Social Influence Facilitating Conditions Trust Perceived Security	Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention* Social Influence → Behavioural Intention# Facilitating Conditions → Behavioural Intention* Trust → Behavioural Intention# Perceived Security → Behavioural Intention*
Chiu, Bool and Chiu (2017)	314 non-adopters of mobile banking in the Philippines	TRA and TPB	Mobile Banking	Disposition of trust Quality of infrastructure Perceived costs Perceived privacy Perceived security Initial trust	Disposition of trust → Behavioural intention* Quality of infrastructure → Behavioural intention* Perceived Costs → Behavioural intention* Perceived Privacy → Behavioural intention*

					Perceived Security → Behavioural intention* Initial Trust → Behavioural intention*
Dimitriadis and Kyrezis (2010)	762 retail bank customers in Greece	TAM	Technology-Enabled Bank Channels: Internet Banking and Phone Banking	Trusting Intention Perceived Usefulness Perceived Ease of Use Perceived Security Perceived Privacy Familiarity Innovativeness Stance to New Technologies Level of Information	**Internet Banking** Trusting Intention →Use Intention* Perceived Usefulness →Use Intention* Perceived Ease of Use →Use Intention# Perceived Security →Use Intention# Perceived Privacy →Use Intention# Familiarity →Use Intention* Innovativeness →Use Intention# Stance to New Technologies →Use Intention* Level of Information → Use Intention* **Phone Banking** Trusting Intention →Use Intention* Perceived Usefulness →Use Intention# Perceived Ease of Use →Use Intention* Perceived Security →Use Intention# Perceived Privacy →Use Intention# Innovativeness →Use Intention* Stance to New Technologies →Use Intention# Level of Information→ Use Intention *

Faria (2013)	284 M-Banking users and non-users in Portugal	UTAUT, ITM and TTF	Mobile Banking	Performance Expectancy Effort Expectancy Social Influence Reputation Initial Trust	Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention# Social Influence → Behavioural Intention# Reputation → Behavioural Intention# Initial Trust → Behavioural Intention*
Farah, Hasni and Abbas (2018)	490 respondents in Pakistan	UTAUT	Mobile Banking	Performance Expectancy Effort Expectancy Social Influence Facilitating Condition Hedonic Motivation Perceived Value Habit Trust Perceived risk	Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention* Social Influence → Behavioural Intention* Facilitating Condition → Behavioural Intention# Hedonic Motivation → Behavioural Intention* Perceived Value → Behavioural Intention* Habit → Behavioural Intention* Trust → Behavioural Intention# Perceived risk (-) → Behavioural Intention#
Escobar-Rodríguez and Carvajal-Trujillo (2014)	130 individuals who had previously purchased air tickets in Spain	UTAUT	Online tickets	Performance Expectancy Effort Expectancy Social Influence Facilitating Conditions Hedonic Motivation Price-Saving Orientation Habit	Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention* Social Influence → Behavioural Intention* Facilitating Conditions → Behavioural Intention*

				Innovativeness in New Technology Trust	Hedonic Motivation → Behavioural Intention* Price-Saving Orientation → Behavioural Intention* Habit→ Behavioural Intention* Innovativeness in New Technology → Behavioural Intention* Trust→ Behavioural Intention *
El Alfy *et al*. (2017)	67 instructors in two private universities located in Egypt and UAE	TR	e-learning technologies	Attitude towards e-learning technologies **Technology Readiness:** Optimism Innovativeness Insecurity Discomfort	Technology readiness → Behavioural Intention towards e-learnings technologies adoption * Attitude towards e-learning technologies→ Behavioural Intention towards e-learnings technologies adoption *
Gu, Lee and Suh (2009)	910 Bank customers in Korea	TAM	Mobile Banking	Perceived Usefulness Perceived Ease of Use Trust	Perceived Usefulness → Behavioural Intention* Perceived Ease of Use → Behavioural Intention* Trust → Behavioural Intention*
Gupta, Manrai and Goel (2019)	660 migrant labourers in India	UTAUT	Payments banks services	Perceived Credibility Performance Expectancy Effort Expectancy Social Influence Facilitating Conditions	Perceived Credibility → Behavioural Intention* Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention* Social Influence → Behavioural Intention* Facilitating Conditions → Behavioural Intention*

Guhr, Loi, Wiegard and Breitner (2013)	50 individuals in Finland, 115 individuals in Germany, 52 individuals in the USA and 53 individuals in Japan	TAM and TRI	Mobile Payment	Technology Readiness Perceived Ease of Use Perceived Usefulness	Technology Readiness → Intention to Use* (not significant for the USA and Finland) Perceived Ease of Use → Intention to Use* Perceived Usefulness → Intention to Use*
Hanafizadeh, Behboudi, Koshksaray and Tabar (2014)	361 University Students in Iran	TAM	Mobile Banking	Perceived Usefulness Perceived Ease of Use Need for Interaction Perceived Risk Perceived Cost Compatibility with lifestyle and needs Trust Credibility	Perceived Usefulness → Behavioural Intention* Perceived Ease of Use → Behavioural Intention* Need for Interaction (-) → Behavioural Intention* Perceived Risk (-) → Behavioural Intention* Perceived Cost (-) → Behavioural Intention* Compatibility with lifestyle and needs → Behavioural Intention* Trust → Behavioural Intention* Credibility → Behavioural Intention*
Hsu, Lin, Chen, Chang and Hsieh (2017)	343 individuals in Taiwan	UTAUT	E-book	Perceived Benefit Performance Expectancy Effort Expectancy Social Influence Facilitating Conditions Environmental Concern Benevolence Trust	Perceived Benefit → Usage Intention* Performance Expectancy → Usage Intention* Effort Expectancy → Usage Intention* Social Influence → Usage Intention* Facilitating Conditions → Usage Intention*

					Environmental Concern → Usage Intention* Benevolence Trust → Usage Intention*
Hur, Lee and Choo (2017)	1,288 Korean consumers residing in Seoul, Korea	TAM	Mobile App Service	Perceived Ease of Use Perceived Usefulness Perceived Playfulness	Perceived Usefulness → Usage Intention* Perceived Ease of Use → Usage Intention# Perceived Playfulness→ Usage Intention*
Hoque and Sorwar (2017)	274 Elderly in Bangladesh	UTAUT	Mobile Health	Performance Expectancy Effort Expectancy Social Influence Facilitating Conditions Resistance to Change Technology Anxiety	Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention* Social Influence → Behavioural Intention* Facilitating Conditions → Behavioural Intention# Resistance to Change (-) → Behavioural Intention* Technology Anxiety (-) → Behavioural Intention*
Isaias, Reis, Coutinho and Lencastre (2017)	79 universities students in Portugal	UTAUT	Mobile and distance learning	Performance Expectancy Effort Expectancy Social Influence Facilitating Condition	Performance Expectancy → Behavioural Intention# Effort Expectancy → Behavioural Intention# Social Influence → Behavioural Intention* Facilitating Condition → Behavioural Intention#
Karma, Ibrahim and Ali (2014)	181 bank's customers in Sudan	TAM	Mobile Banking	Perceived Usefulness Perceived Ease of Use	Perceived Usefulness → Behavioural Intention#

				Perceived Trust Perceived Risk	Perceived Ease of Use → Behavioural intention* Perceived Trust → Behavioural intention* Perceived Risk (-) → Behavioural intention#
Khalilzadeh, Ozturk and Bilgihan (2017)	412 restaurant customers in the US	UTAUT	NFC-based Mobile Payment	Performance Expectancy Effort Expectancy Social Influence Facilitating Conditions Trust	Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention* Social Influence → Behavioural Intention* Facilitating Conditions → Behavioural Intention# Trust → Behavioural Intention#
Kuo, Liu and Ma (2013)	665 nurses in Taiwan	TAM and TRI	Mobile electronic medical record systems	Perceived Ease of Use Perceived Usefulness	Perceived Ease of Use → Behavioural Intention* Perceived Usefulness → Behavioural Intention*
Kongarchapatara (2018)	275 respondents in Thailand	TAM	QR Code Payment Application	Perceived Usefulness Perceived Ease of Use Perceived Credibility	Perceived Usefulness → Behavioural Intention to Use* Perceived Ease of Use → Behavioural Intention to Use* Perceived Credibility → Behavioural Intention to Use*
Larasati, Havidz, Kefan, Aima and Ali (2018)	208 Indonesia citizenship that resides in China	UTAUT	WeChat mobile payment	Performance Expectancy Effort Expectancy Social Influence Facilitating Conditions	Performance Expectancy → Behavioural intention to adopt WeChat mobile payment# Effort Expectancy → Behavioural intention to adopt WeChat mobile payment#

					Social Influence → Behavioural intention to adopt WeChat mobile payment# Facilitating Conditions → Behavioural intention to adopt WeChat mobile payment*
Li (2013)	522 Undergraduate students in China	TAM, TRA and TPB	Mobile Banking	Trust	Trust → Behavioural Intention*
Lim, Ahmad, and Talib (2018)	487 non-e-wallet users in Malaysia	TRI and UTAUT	E-wallet transaction via QR code	Performance Expectancy Effort Expectancy Social Influence Facilitating Conditions	Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention* Facilitating Conditions → Behavioural Intention* Social Influence → Behavioural Intention*
Lin and Chang (2011)	410 individuals in Taiwan	TAM and TRI	Self-service technology	Perceived Usefulness Attitude Toward Using SSTs Technology Readiness	Perceived Usefulness → Behavioural Intentions* Attitude Toward Using SSTs → Behavioural Intentions* Technology Readiness → Behavioural Intentions*
Naranjo-Zolotov *et al*. (2018)	210 users of e-participation in Portugal	UTAUT and Empowerment Theory	E-participation	Performance Expectancy Effort Expectancy Social Influence Facilitating Conditions Empowerment	Performance Expectancy → Intention to Use* Effort Expectancy → Intention to Use# Social Influence → Intention to Use# Facilitating Conditions → Intention to Use* Empowerment → Intention to Use*
Njenga and Salih (2019)	145 Sudanese mobile users	UTAUT	Mobile commerce	Performance Expectancy Effort Expectancy	Performance Expectancy → Behavioural Intention#

				Trust (Social Influence) Perceived Technology Risk	Effort Expectancy → Behavioural Intention# Trust (Social Influence) → Behavioural Intention* Perceived Technology Risk → Behavioural Intention*
Olaleye and Sanusi (2019)	224 respondents from different companies in Nigeria	UTAUT	E-invoicing	Anxiety Effort Expectancy Facilitating Conditions Financial Risk Image Performance Expectancy Social Influence Technology Literacy	Anxiety (-) → Behavioural Intentions* Effort Expectancy → Behavioural Intention# Facilitating Conditions → Behavioural Intention* Financial Risk (-) → Behavioural Intention* Image → Behavioural Intention* Performance Expectancy → Behavioural Intention# Social Influence → Behavioural Intention* Technology Literacy → Behavioural Intention*
Oliveira, Faria, Thomas and Popovic (2014)	194 individuals from Portugal	TTF, UTAUT and ITM,	Mobile Banking	Performance Expectancy Effort Expectancy Social Influence Reputation Initial Trust	Performance Expectancy → Behavioural Intention# Effort Expectancy → Behavioural Intention# Social Influence → Behavioural Intention# Reputation → Intention# Initial Trust → Intention*
Owusu Kwateng, Osei Atiemo and Appiah (2019)	300 users of m-banking services in Ghana	UTAUT2	Mobile Banking	Effort Expectancy Facilitating Conditions Habit Hedonic Motivation	Effort Expectancy → Behavioural Intention# Facilitating Conditions → Behavioural Intention#

				Price Value Performance Expectancy Social Influence Trust	Habit → Behavioural Intention* Hedonic Motivation → Behavioural Intention# Price Value (-) → Behavioural Intention* Performance Expectancy → Behavioural Intention# Social Influence → Behavioural Intention# Trust → Behavioural Intention*
Pattansheti, Kamble, Dhume and Raut (2016)	270 mobile phone users in Mumbai	TBP, TRI and TAM	Mobile Banking	Subjective Norm Attitude Perceived Behavioural Control	Subjective Norm → Behavioural Intention* Attitude → Behavioural Intention* Perceived Behavioural Control → Behavioural Intention*
Priya, Gandhi and Shaikh (2018)	269 young Indian in India	TAM	Mobile Banking	Perceived Ease of Use Perceived Usefulness Perceived Credibility Structural Assurance User Satisfaction	Perceived Ease of Use → Behavioural Intention* Perceived Usefulness → Behavioural Intention* Perceived Credibility → Behavioural Intention* Structural Assurance → Behavioural Intention* User Satisfaction→ Behavioural Intention*
Rojas-Méndez, Parasuraman and Papadopoulos (2017)	499 individuals in the USA and 501 individuals in Chile	TRI	Technology-based products and services	Innovativeness Optimism Discomfort Insecurity	Innovativeness → Behavioural toward technology* Optimism → Behavioural toward technology# Discomfort (-) → Behavioural toward technology*

					Insecurity (-) → Behavioural toward technology*
Rahi Ghani (2018)	398 customers of commercial banks in Malaysia	UTAUT, DOI	Internet Banking	Performance Expectancy Effort Expectancy Compatibility Perceived technology security	Performance Expectancy → Intention to adopt internet banking* Effort Expectancy → Intention to adopt internet banking* Compatibility → Intention to adopt internet banking* Perceived technology security → Intention to adopt internet banking*
Raza *et al*. (2018)	229 users of Islamic banks in Pakistan	UTAUT	Mobile banking	Performance Expectancy Effort Expectancy Social Influence Facilitating Conditions Hedonic Motivation Perceived Value Habit	Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention* Social Influence → Behavioural Intention# Facilitating Condition → Behavioural Intention* Hedonic Motivation → Behavioural Intention* Perceived Value → Behavioural Intention* Habit → Behavioural Intention*
Rana, Dwivedi, Williams and Weerakkody (2016)	419 citizens in India	UTAUT	E-government (online public grievance redressal system)	Facilitating Conditions	Facilitating Conditions → Behavioural Intention#
Rahi, Ghani, Alnaser and Ngah (2018)	398 internet banking users in Malaysia	UTAUT	Internet Banking	Performance Expectancy Effort Expectancy Social Influence Facilitating Condition	Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention*

					Social Influence → Behavioural Intention* Facilitating Condition → Behavioural Intention*
San Martín and Herrero (2012)	1083 rural accommodation in Spain	UTAUT	Online purchase intention regarding rural tourism	Performance Expectancy Effort Expectancy Social Influence Facilitating Condition Innovativeness (refer to psychological factor)	Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention* Social Influence → Behavioural Intention# Facilitating Condition → Behavioural Intention# Innovativeness → Behavioural Intention*
Schaupp, Carter and McBride (2010)	260 MBA students in the USA	UTAUT	E-government services	Performance Expectancy Effort Expectancy Social Influence Facilitating Conditions Trust of the e-file system Trust of Internet Optimism Bias	Performance Expectancy → Intention to Use* Effort Expectancy → Intention to Use# Social Influence → Intention to Use* Facilitating Conditions → Intention to Use# Trust of the e-file system →Intention to Use* Trust of Internet → Intention to Use# Optimism Bias → Intention to Use*
Shaw and Sergueeva (2019)	287 Canadian smartphone owners in Canada	UTAUT2	Mobile Commerce	Social Influence Facilitating Conditions Hedonic motivation Habit Effort Expectancy Perceived Value	Social Influence → Intention to Use# Facilitating Conditions → Intention to Use# Hedonic motivation →Intention to Use* Habit →Intention to Use*

					Effort Expectancy → Intention to Use* Perceived Value → Intention to Use*
Singeh, Abrizah and Karim (2013)	108 individuals within the university in Malaysia	UTAUT	Self-archive in their institutional repository	Performance Expectancy Effort Expectancy Social Influence Facilitating Conditions	Performance Expectancy → Behavioural Intention# Effort Expectancy → Behavioural Intention# Social Influence → Behavioural Intention# Facilitating Conditions → Behavioural Intention#
Singh and Srivastava (2018)	855 bank customers in India	TAM, SCT, and UTAUT	Mobile Banking	Computer Self-efficacy Perceived Ease of Use Perceived Financial Cost Social Influence Trust Security	Computer Self-efficacy → Behavioural Intention* Perceived Ease of Use → Behavioural Intention* Perceived Financial Cost → Behavioural Intention* Social Influence → Behavioural Intention# Trust → Behavioural Intention# Security→ Behavioural Intention*
Seol, Ko and Yeo (2017)	534 golf smart wearable devices users in Seoul	UTAUT and TR	Sport smart wearable devices	Positive Technology Readiness (Optimism and Innovativeness) Negative Technology Readiness (Insecurity and Discomfort) Social Influence Performance Expectancy Effort Expectancy Perceived Enjoyment	Positive Technology Readiness → Behavioural Intention# Negative Technology Readiness (-) → Behavioural Intention# Social Influence → Behavioural Intention# Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention*

					Perceived Enjoyment→ Behavioural Intention*
Susanto, Lee, Zo, and Ciganek (2013)	251 Indonesian bank customers	ITM	Internet banking	Relative Benefits Perceived Security Perceived Privacy Website Usability Government Support Initial Trust	Relative Benefits → Usage Intention * Perceived Security → Usage Intention* Perceived Privacy → Usage Intention* Website Usability → Usage Intention* Government Support → Usage Intention# Initial Trust → Usage Intention*
Sinha, Majra, Hutchins and Saxena (2018)	600 respondents from India	UTAUT and TR	Mobile Payment	**Adoption Readiness:** Performance Expectancy Ease of Use Social Influences Facilitating Conditions **Technology Readiness:** Optimism Innovativeness Insecurity Discomfort	Adoption Readiness → Intention to Adopt* Technology Readiness → Intention to Adopt*
Suki and Suki (2017)	300 universities students in Malaysia	UTAUT	The technology of Animation and Storytelling	Performance Expectancy Effort Expectancy Social Influence Facilitating Conditions	Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention* Social Influence → Behavioural Intention# Facilitating Conditions → Behavioural Intention*

Salloum (2019)	280 students in Dubai	UTAUT	E-learning system	Performance Expectancy Effort Expectancy Social Influence	Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention# Social Influence → Behavioural Intention*
Tarhini, El-Masri, Ali and Serrano (2016)	422 universities students in Lebanon	UTAUT and TTF	Internet banking	Performance Expectancy Effort Expectancy Social Influence Facilitating Condition Perceived Credibility Task-Technology Fit	Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention# Social Influence → Behavioural Intention* Facilitating Condition → Behavioural Intention* Perceived Credibility → Behavioural Intention* Task-Technology Fit→ Behavioural Intention*
Tan and Lau (2016)	347 University students in Malaysia Age: 18-25	UTAUT	Mobile Banking	Effort Expectancy Performance Expectancy Social Influence Perceived Risk	Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention* Social Influence → Behavioural Intention* Perceived Risk (-) → Behavioural Intention*
Thongsri, Shen, Bao and Alharbi (2018)	359 undergraduates in Thailand	UTAUT	Mobile learning	Social Influence Performance Expectancy Effort Expectancy	Performance Expectancy → Intention to Use M-learning* Effort Expectancy → Intention to Use M-learning# Social Influence → Intention to Use M-learning#

Teo, Tan, Ooi, Hew and Yew (2015)	194 university students in Malaysia	UTAUT	Mobile payment	Social Influence Performance Expectancy Effort Expectancy Facilitating conditions Perceived Transaction Convenience Perceived Transaction Speed	Social Influence → Intention to Use# Performance Expectancy → Intention to Use# Effort Expectancy → Intention to Use* Facilitating conditions→ Intention to Use* Perceived Transaction Convenience → Intention to Use# Perceived Transaction Speed → Intention to Use*
Thakur and Srivastava (2014)	774 respondents (current banking and mobile phone customers) in India	TAM and UTAUT	Mobile Payment	**Adoption Readiness:** Perceived Usefulness Perceived Ease of Use Facilitating Conditions Social Influence Personal Innovativeness **Perceived Risk:** Security Risk Privacy Risk Monetary Risk	Adoption Readiness → Behavioural Intention* Personal Innovativeness → Behavioural Intention* Perceived Risk (-) → Behavioural Intention*
Tobbin (2012)	97 Rural Unbanked (8 to 12 Focus Group) in Denmark (qualitative research)	TAM	Mobile Banking	Perceived Usefulness Perceived Ease of Use Perceived Economic Factors Perceived Trust	Perceived Usefulness → Intention* Perceived Ease of Use → Intention* Perceived Economic Factors → Intention* Perceived Trust → Intention*
Zhou (2012a)	200 individuals in China	TAM, IDT and UTAUT	Mobile Banking	Trust Flow	Trust → Usage intention* Flow →Usage intention*

Zhou (2011)	210 consumers in China	TAM, IDT and UTAUT	Mobile Banking	Initial Trust Perceived usefulness	Initial trust → behavioural intention* Perceived usefulness → behavioural intention*
Zuiderwijk, Janssen and Dwivedi (2015)	111 citizens in various countries	UTAUT	Open data technologies	Performance Expectancy Effort Expectancy Social Influence Facilitating Condition Voluntariness	Performance Expectancy → Behavioural Intention* Effort Expectancy → Behavioural Intention* Social Influence → Behavioural Intention* Facilitating Condition → Behavioural Intention# Voluntariness (-) → Behavioural Intention*

2.8.2 Determinants of Performance Expectancy

Performance expectancy is well-defined as the extent to which people believe that task performance is improved by using a certain system (Venkatesh *et al*., 2003). Performance expectancy used to share the almost similar definition of perceived usefulness in TAM, where it is people's belief to improve job performance by implementing this system (Davis, 1989). Perceived usefulness also refer to which the mobile technology and services offer them the benefit of utilising it every day (Knutsen, Constantiou, & Damsgaard, 2005). The following sections will focus on the effect of five antecedents of performance expectancy, namely effort expectancy, optimism, innovativeness, discomfort and insecurity.

2.8.2.1 The relationship between optimism and performance expectancy

Individuals who are technological optimism will believe that new technologies will bring benefits for them, such as increased control, flexibility and life-saving efficiency (Parasuraman, 2000a; Parasuraman & Colby, 2015). Optimists are less focused on the negative side and will easily to adopt technology in their life. This will allow optimists to perceive technology as more useful to adopt, and feeling less annoying at the negative technological effects. Walczuch, Lemmink and Streukens (2007) support this by revealing that they are less worry about the possibility of negative sides of technology (Walczuch *et al*., 2007).

In other settings such as mobile electronic medical records systems, a study conducted by Kuo, Liu and Ma, (2013), they have investigated the relationship between optimism and perceived usefulness by using the theory of TAM. The researchers found that it had a significant and positive result between optimism and perceived usefulness. While another study conducted by Lin and Chang (2011) in the setting of self-service

technology. Their result shows that technology readiness has a positive impact on perceived usefulness. On the other sides, Seol, Ko and Yeo, (2017) examined the relationship between positive technology readiness and performance expectancy by using UTAUT. A similar relationship was found, but the study does not indicate the specific relationship of all the four constructs in technology readiness.

After the literature reviewed, as shown in Table 2.4, few researchers have attempted to analyse in-depth the relationship between optimism and performance expectancy; consequently, this relationship is not yet well understood. More in-depth investigations are required. Therefore, this study intends to fill the gap by investigating the relationship between optimism and performance expectancy of e-wallet transaction via QR code in Malaysia.

2.8.2.2 The relationship between innovativeness and performance expectancy

Researchers in the technology acceptance field argued that individuals with higher levels of innovativeness in IT could be anticipated to develop positive opinions about the methods in terms of benefits and advantages (perceived usefulness) of the system (Agarwal & Prasad, 1998; Lu, Yao, & Yu, 2005; Rahi & Ghani, 2018). Furthermore, the majority of potential users with the intention to accept, do not possess a large amount of information on different mobile data services or have formed obvious perception beliefs (Bhatti & Qureshi, 2007). People that are technology seekers would be more positive in their beliefs regarding the new mobile services (Mao, Srite, Bennett Thatcher, & Yaprak, 2005). It is most likely to observe that personal innovativeness in IT factor will generate a strong influence on perceived usefulness (Agarwal & Prasad, 1998; Lu *et al*., 2005).

Also, claimed by Rahi Ghani (2018), innovation and an urgent need for the latest and simple information systems have received much attention in the financial sector. Some banks use online banking to decrease costs while improving customer service. As a result, the growth of online banking is limited and in many cases, falls short of expectations. Rahi Ghani (2018) used to grow comprehensive models that combine technologies, innovations and factor of the environment to get know about customer intention to use and to recommend online banking on Malaysian social networks. Overall, 398 valid responses were collected from commercial bank customers using a convenience sampling approach. The data analysed using structural equation modelling. The result demonstrated that innovativeness positive and significantly influences performance expectancy.

Prior studies in Table 2.4 show that that relationship between innovativeness and performance expectancy received very little attention from the past researchers, especially in the UTAUT theory. A similar word, such as personal web innovativeness, was discovered to have a significant positive relationship toward performance expectancy within the setting of an Australian online family dispute resolution system (Casey & Wilson-Evered, 2012). Other researchers found the relationship was insignificant (Kuo *et al*., 2013). Moreover, after reviewing the literature, it can be concluded that the relationships between innovativeness and performance expectancy is inconsistent and have received minimal attention from different technology field and almost no attention in the domain of e-wallet transaction via QR code.

2.8.2.3 The relationship between discomfort and performance expectancy

Individuals might tend to feel anxious toward a technology when they perceived a lack of control over technology and a feeling of confusing toward the technology

(Parasuraman, 2000a; Parasuraman & Colby, 2015). Uncomfortable individuals may feel unfamiliar with the technology such as wireless and mobile operations, and consequently cannot use the technology comfortably (Kuo *et al*., 2013). According to Pattansheti, Kamble, Dhume and Raut (2016), they found that there is no relationship between discomfort and perceived usefulness.

After a review of the literature in Table 2.4, the relationship received very little attention. One of the past studies had examined this relationship, but they have found that the relationship was insignificant toward perceived usefulness in their study (Kuo *et al*., 2013). However, a similar construct to computer anxiety, which has been proven to have a negative impact and perceived usefulness (Igbaria, Schiffman, & Wieckowski, 1994). This relationship received poor attention from researchers in the e-wallet transaction via QR code field.

2.8.2.4 The relationship between insecurity and performance expectancy

Insecurity refers to scepticism about its ability to function accurately and the distrust of technology (Parasuraman, 2000a; Parasuraman & Colby, 2015). It focuses specifically on how an individual feels about the operation of technology-based products or services (Sophonthummapharn & Tesar, 2007). Consumers may feel that there might be some risks when using new technologies. Once people believe that they can gain advantages in using this new technology, then they are willing to take the risk of using such technology (Tsikriktsis, 2004).

There are several empirical studies have focused on the domain of mobile internet in examining the effect of insecurity on perceived usefulness. According to the study by Kuo *et al*. (2013), they tested and argued that insecurity should have a negative impact

on perceived usefulness. However, the result is unexpected, as a result, is not significant. On the other hand, Cimperman, Makovec Brenčič and Trkman (2016) investigated the factors that predict the users' acceptance towards Home Telehealth Services in Slovenia. However, they found a significant relationship between perceived security and performance expectancy. They found that learning to understand and manage technology-related risks is a major obstacle to technology adoption. Technology increases the perception of safe operation and information will increase the perception of technology that more useful and easier to use.

In the domain of mobile banking, Pattansheti, Kamble, Dhume and Raut (2016) found that there is a related relationship between insecurity and perceived usefulness in Mumbai. However, the roles of insecurity and performance expectancy received little attention from previous studies in the domain of the acceptance of e-wallet transaction via QR code.

Thus, from the literature review in Table 2.4, it can be determined that the influence of insecurity and performance expectancy receiving little attention from past researchers, where only Seol, Ko and Yeo (2017) explore the relationship by integrating insecurity with discomfort to become one construct, named 'negative technology readiness' in their study.

Table 2. 4
Some of the Previous Studies Investigating the Antecedents of Performance Expectancy

Studies	**Subjects**	**Theory/ Model**	**Technology**	**Proposed Antecedents of Performance Expectancy**	**Findings *Significant, #Insignificant**
Al-Queisi, Dennis, Alamanos and Jayawardhena (2014)	216 users of banking services in the UK	UTAUT	Internet banking	Effort Expectancy Social Influence Web Design Quality (Technical Quality, General Content Quality, Special Content Quality, Appearance Quality) Experience	Effort Expectancy → Performance Expectancy* Social Influence →Performance Expectancy# Web Design Quality →Performance Expectancy* Experience → Performance Expectancy#
Casey and Wilson-Evered (2012)	127 staff in Australia	UTAUT	Online family dispute resolution	Personal Web Innovativeness	Personal Web Innovativeness → Performance Expectancy*
Chaouali, Ben Yahia and Souiden (2016)	245 university students in Tunisia	UTAUT	Internet banking services	Trust	Trust → Performance Expectancy*
Cimperman, Makovec Brenčič and Trkman (2016)	400 participants aged 50 years and above in Slovenia	UTAUT	Home telehealth services	Effort Expectancy Doctor's Opinion Influence Perceived Security	Effort Expectancy → Performance Expectancy* Doctor's Opinion Influence → Performance Expectancy* Perceived Security → Performance Expectancy*
Guhr, Loi, Wiegard and Breitner (2013)	50 individuals in Finland, 115 individuals in Germany, 52 individuals in the USA and 53 individuals in Japan	TAM and TRI	Mobile Payment	Technology Readiness Perceived Ease of Use	Technology Readiness → Perceived Usefulness* Perceived Ease of Use → Perceived Usefulness *

Hur, Lee and Choo (2017)	1,288 Korean consumers residing in Seoul, Korea	TAM	Mobile App Service	Perceived Ease of Use **Personal Innovativeness:** Technological Innovativeness Fashion Innovativeness	Perceived Ease of Use → Perceived Usefulness * Technological Innovativeness → Perceived Usefulness# Fashion Innovativeness → Perceived Usefulness#
Khalilzadeh, Ozturk and Bilgihan (2017)	412 restaurant customers in the US	UTAUT	NFC-based Mobile Payment	Effort Expectancy Trust	Effort Expectancy → Performance Expectancy* Trust → Performance Expectancy *
Kim and Kang (2012)	247 public Koreans	TAM	Smartphone Banking	Perceived Ease of Use Trust	Perceived Ease of Use → Perceived Usefulness * Trust→ Perceived Usefulness*
Kuo, Liu and Ma (2013)	665 nurses in Taiwan	TAM and TRI	Mobile electronic medical record systems	Optimism Innovativeness Insecurity Discomfort Perceived Ease of Use	Optimism → Perceived Usefulness* Innovativeness → Perceived Usefulness# Insecurity (-) → Perceived Usefulness# Discomfort (-) → Perceived Usefulness# Perceived Ease of Use → Perceived Usefulness*
Lin and Chang (2011)	410 individuals in Taiwan	TAM and TRI	Self-service technology	Technology Readiness Perceived Ease of Use	Technology Readiness→ Perceived Usefulness* Perceived Ease of Use → Perceived Usefulness*
Nguyen and Huynh (2018)	200 individuals in Ho Chi Minh City, Vietnam	TAM	E-payment	Trust Perceived Risk	Trust → Perceived Usefulness # Perceived Risk (-) → Perceived Usefulness #
Pattansheti, Kamble, Dhume and Raut (2016)	270 mobile phone users in Mumbai	TBP, TRI and TAM	Mobile Banking	Optimism Innovativeness Insecurity Discomfort Perceived Ease of Use	Optimism → Perceived Usefulness* Innovativeness → Perceived Usefulness* Insecurity → Perceived Usefulness* Discomfort → Perceived Usefulness# Perceived Ease of Use → Perceived Usefulness#
Rana, Dwivedi, Williams and Weerakkody (2016)	419 citizens in India	UTAUT	E-government (online public grievance	Effort Expectancy	Effort Expectancy → Performance Expectancy*

			redressed system)		
Rahi Ghani (2018)	398 customers of commercial banks in Malaysia	UTAUT, DOI	Internet Banking	Compatibility Innovativeness	Compatibility → Performance Expectancy* Innovativeness→ Performance Expectancy*
Sinha, Majra, Hutchins and Saxena (2018)	600 respondents from India	UTAUT and TR	Mobile Payment	**Technology Readiness:** Optimism Innovativeness Insecurity Discomfort	Technology Readiness → Adoption Readiness (**Performance Expectancy**, Ease of Use, Social Influences and Facilitating Conditions) *
Tobbin (2012)	97 Rural Unbanked in Denmark (qualitative research)	TAM	Mobile Banking	Level of Convenience Level of Affordability	Level of Convenience → Perceived Usefulness* Level of Affordability → Perceived Usefulness*
Teo, Tan, Ooi, Hew and Yew (2015)	194 university students in Malaysia	UTAUT	Mobile payment	Effort Expectancy Perceived Transaction Convenience Perceived Transaction Speed	Effort Expectancy → Performance Expectancy* Perceived Transaction Convenience → Performance Expectancy* Perceived Transaction Speed → Performance Expectancy#
Thongsri, Shen, Bao and Alharbi (2018)	359 undergraduates in Thailand	UTAUT	Mobile learning	Cognitive Need Effort Expectancy	Cognitive Need → Performance Expectancy* Effort Expectancy → Performance Expectancy*
Thakur and Srivastava (2014)	774 respondents (current banking and mobile phone customers) in India	TAM and UTAUT	Mobile Payment	Personal Innovativeness	Personal Innovativeness → Adoption Readiness (**Perceived Usefulness**, Perceived Ease of Use, Facilitating Conditions and Social Influence) *
Seol, Ko and Yeo (2017)	534 golf smart wearable devices users in Seoul	UTAUT and TR	Sport smart wearable devices	Positive Technology Readiness (Optimism and Innovativeness) Negative Technology Readiness (Insecurity and Discomfort)	Positive Technology Readiness → Performance Expectancy* Negative Technology Readiness (-) → Performance Expectancy*

Siyal, Ding and Siyal (2019)	200 individuals in Pakistan	TAM	Mobile banking	Awareness Initial Trust Compatibility Perceived Risk	Awareness → Perceived Usefulness* Initial Trust → Perceived Usefulness* Compatibility → Perceived Usefulness* Perceived Risk (-) → Perceived Usefulness*
Zhou (2011)	210 consumers in China	TAM, IDT and UTAUT	Mobile banking	Information quality System quality Initial Trust	Information Quality → Perceived Usefulness* System Quality → Perceive Usefulness* Initial Trust → Perceived Usefulness*

2.8.3 Determinants of Effort Expectancy

Effort Expectancy is one of an important predictor of technology acceptance. In UTAUT, effort expectancy is the root construct of the perceived ease of use from the original TAM model (Kim & Park, 2012). It refers to the extent of ease that related to the use of technology by the consumer (Venkatesh *et al*., 2003). The following paragraphs will focus on and discuss the effect of three antecedents of effort expectancy, namely optimism, innovativeness, discomfort and insecurity.

2.8.3.1 The relationship between optimism and effort expectancy

Optimism is a universal construct that captures people's specific feelings and shows that technology is a good thing (Parasuraman, 2000a; Parasuraman & Colby, 2015). Matthing, Kristensson, Gustafsson and Parasuraman (2006) in the technology acceptance filed argued that optimistic individuals think about intelligence, and they have the willingness to solve the problem of making effective use of innovative services. Technology optimists adopt a more optimistic strategy and are generally more effective in achieving the anticipated results. In simple words, optimists are less likely to pay attention to the negative outcome, but they accept technology more easily. Therefore, optimists think technology is easier to use because they are less annoyed with the negative consequences of technology (Kuo *et al*., 2013).

There are few empirical studies have generally supported this relationship, but perceived ease of use was used to represent effort expectancy in the past studies, and this relationship was not clear as previous studies used to combine several determinants to represent technology readiness in their studies. For instance, Guhr, Loi, Wiegard and Breitner (2013) investigate how technology readiness influences clients'

perception and acceptance of mobile payment in Finland, the USA, Germany and Japan. In their study, they do not investigate every construct in TRI, but they just used optimism, innovativeness, discomfort and insecurity to represented technology readiness in their study. Their findings showed the relationship between technology readiness and perceived ease of use in TAM is significant and positive.

This relationship is also confirmed by Lin and Chang, (2011). More specifically, Kuo, Liu and Ma (2013) and Shin and Lee (2014) who had to investigate the relationship between optimism and perceived ease of use is found to have a significant and positive relationship. This relationship is further supported by Pattansheti, Kamble, Dhume and Raut (2016).

In general, after reviewing the literature as shown in Table 2.5, it can be concluded that the relationship is significantly and positively influencing between optimism and effort expectancy, and it has a supported among the studies. However, this relationship received not much in the setting of e-wallet transaction via QR code.

2.8.3.2 The relationship between innovativeness and effort expectancy

Innovativeness is a propensity of an individual to be thought leader and pioneer (Parasuraman, 2000a). It is considered as a vital element of cognitive engagement that in turn, affects perceive ease of use (Kuo *et al*., 2013; Parasuraman, 2000a; Rahi & Ghani, 2018). These highly innovative people are eager to experiment with these new technologies and tend to learn new features and practice skills.

Very few empirical studies have investigated the relationship between technology readiness and effort expectancy or perceived ease of use (Guhr *et al*., 2013; Hur *et al*.,

2017; Kuo *et al*., 2013; Lin & Chang, 2011; Seol *et al*., 2017). According to Pattansheti, Kamble, Dhume and Raut (2016), the relationship between innovativeness was found to have a significant and positive influence on perceived ease of use. Besides that, this relationship was further supported by Hur *et al*. (2017). The study aimed to analyse the effect of consumer technologies and fashion innovativeness on behavioural intention to use a fashion image search app, based particularly on the TAM in Korea. The results indicated that individuals with a high degree of technological innovativeness tend to adopt an innovative app service if the app is easy to use. Therefore, the findings showed that technology readiness was significantly and positively affected the effort expectancy or perceived ease of use, as shown in past studies in Table 2.5.

After the critical literature reviewed, it can be concluded that the prior studies established the relationship between technology readiness and effort expectancy and proved the significance of the role of technology readiness on effort expectancy. However, indeed, the relationship between innovativeness and effort expectancy has received considerably less attention from researchers. But almost no detail study uses to investigate innovativeness as an exogenous variable in the past study.

2.8.3.3 The relationship between discomfort and effort expectancy

Discomfort is the perceived lack of control over technology and feelings of being overcome by technology. Consumers who feel uncomfortable about technology tend to believe and think that they are under control by technology and technology is not suitable for ordinary people (Parasuraman, 2000a).

In other settings, for instance, Kuo, Liu and Ma (2013) explore the impact of nurse technical readiness on the acceptance of mobile electronic medical record systems (MEMR) by using TAM and TRI. The results show that discomfort has a significant negative impact on the perceived ease of use. They argue that if they perceived that the MEMR as discomfort, it would be probably to see MEMR is not easy to use. Uncomfortable nurses may be familiar with the current or easier technologies, and they might refuse to use high-tech or new technologies if they perceive the new technology is more complicated than the existing one. Uncomfortable nurses might not be able to use the dramatic changes and worrying about the use of MEMR if they perceive that MEMR requires a lot of effort.

After reviewed the literature as sown in Table 2.5, only a few studies have explored the relationship between the role of discomfort and effort expectancy; however, they applied the TAM theory but not UTAUT in their study (Kuo *et al*., 2013; Pattansheti *et al*., 2016). According to Pattansheti, Kamble, Dhume and Raut (2016), there is a no relationship between discomfort and perceived ease of use base on TAM. Nevertheless, as discuss before, although the study of Seol, Ko and Yeo, (2017) investigated the relationship based on UTAUT, however, they do not separate the construct of discomfort out from the construct of 'negative technology readiness' in their study, and they do not confirm that there is a negative relationship between negative technology readiness and effort expectancy. Likewise, this relationship in the domain of e-wallet transaction via QR code received almost no attention in the previous study.

2.8.3.4 The relationship between insecurity and effort expectancy

Consumers who feel in insecurity condition often lack confidence about the security of new technologies. Usually, they always request for assurances. Individuals with

highly technological insecurity sense will concern and worry about these negative outcomes. The more insecurity that an individual possesses, the less effort expectancy towards technology is perceived by the individual (Kuo *et al.*, 2013).

The link between insecurity and perceived ease of use is confirmed in the study of Kuo, Liu and Ma, (2013). The outcomes of their study showed that insecurity has a negative impact on perceived ease of use based on the TAM. On the other hand, Cimperman, Makovec Brenčič and Trkman, (2016) revealed that perceived security and computer anxiety positioned as an antecedent of effort expectancy and found to have a significant relationship. However, although insecurity demonstrates a negative feeling in technology readiness, Seol, Ko and Yeo (2017) show that negative technology readiness does not influence effort expectancy.

After the literature reviewed, as shown in Table 2.5, it can be concluded that the previous studies established the relationship and proved the significant negative of the role of insecurity and effort expectancy. Moreover, indeed, the relationship has received considerably less attention from the previous study.

Table 2. 5
Some of the Previous Studies Investigating the Antecedents of Effort Expectancy

Studies	Subjects	Theory/ Model	Technology	Proposed Antecedents of Effort Expectancy	Findings *Significant, #Insignificant
Al-Queisi, Dennis, Alamanos and Jayawardhena (2014)	216 users of banking services in the UK	UTAUT	Internet banking	Experience	Experience → Effort Expectancy*
Casey and Wilson-Evered (2012)	127 staff in the implementation organisation in Australia	UTAUT	Online family dispute resolution	Web Innovativeness Trust in Technology	Web Innovativeness → Effort expectancy * Trust in Technology → Effort expectancy*
Cimperman, Makovec Brenčič and Trkman (2016)	400 participants aged 50 years and above in Slovenia	UTAUT	Home telehealth services	Computer Anxiety Perceived Security	Computer Anxiety (-) → Effort expectancy* Perceived Security → Effort expectancy*
Guhr, Loi, Wiegard and Breitner (2013)	50 individuals in Finland, 115 individuals in Germany, 52 individuals in the USA and 53 individuals in Japan	TAM and TRI	Mobile Payment	Technology Readiness	Technology Readiness→ Perceived Ease of Use*
Hur, Lee and Choo (2017)	1,288 Korean consumers residing in Seoul, Korea	TAM	Mobile App Service	**Personal Innovativeness:** Technological Innovativeness Fashion Innovativeness	Technological Innovativeness → Perceived Ease of Use* Fashion Innovativeness → Perceived Ease of Use#
Lin and Chang (2011)	410 individuals in Taiwan	TAM and TRI	Self-service technology	Technology Readiness	Technology Readiness→ Perceived Ease of Use*

Nguyen and Huynh (2018)	200 individuals in Ho Chi Minh City, Vietnam	TAM	E-payment	Trust Perceived Risk	Trust → Ease of Use* Perceived Risk (-) → Ease of Use#
Kuo, Liu and Ma (2013)	665 nurses in Taiwan	TAM and TRI	Mobile electronic medical record systems	Optimism Innovativeness Insecurity Discomfort	Optimism → Perceived Ease of Use* Innovativeness → Perceived Ease of Use* Insecurity (-) → Perceived Ease of Use* Discomfort (-) → Perceived Ease of Use*
Shin and Lee (2014)	585 college students in Korea	TAM and TRI	NFC Mobile Payment	Optimism Innovativeness Insecurity Discomfort	Optimism (+) → Perceived Ease of Use* Innovativeness (+) → Perceived Ease of Use* Insecurity (-) → Perceived Ease of Use* Discomfort (+) → Perceived Ease of Use*
Siyal, Ding and Siyal (2019)	200 individuals in Pakistan	TAM	Mobile banking	Awareness Initial Trust Compatibility Perceived Risk	Awareness → Perceived Ease of Use* Initial Trust → Perceived Ease of Use* Compatibility → Perceived Ease of Use* Perceived Risk (-) → Perceived Ease of Use*
Seol, Ko and Yeo (2017)	534 golf smart wearable devices users in Seoul	UTAUT and TRI	Sport smart wearable devices	Positive Technology Readiness (Optimism and Innovativeness) Negative Technology Readiness (Insecurity and Discomfort)	Positive Technology Readiness → Effort Expectancy* Negative Technology Readiness (-) → Effort Expectancy#
Sinha, Majra, Hutchins and Saxena (2018)	600 respondents from India	UTAUT and TR	Mobile Payment	**<u>Technology Readiness:</u>** Optimism Innovativeness Insecurity Discomfort	Technology Readiness → Adoption Readiness (Performance Expectancy, **Ease of Use**, Social Influences and Facilitating Conditions) *
Pattansheti, Kamble, Dhume and Raut (2016)	270 mobile phone users in Mumbai	TBP, TRI and TAM	Mobile Banking	Optimism Innovativeness Insecurity Discomfort	Optimism → Perceived Ease of Use* Innovativeness → Perceived Ease of Use* Insecurity → Perceived Ease of Use* Discomfort → Perceived Ease of Use#

Rahi Ghani (2018)	398 customers of commercial banks in Malaysia	UTAUT, DOI	Internet Banking	Compatibility Innovativeness	Compatibility → Effort Expectancy* Innovativeness→ Effort Expectancy*
Teo, Tan, Ooi, Hew and Yew (2015)	194 university students in Malaysia	UTAUT	Mobile payment	Perceived Transaction Convenience Perceived Transaction Speed	Perceived Transaction Convenience → Effort Expectancy* Perceived Transaction Speed → Effort Expectancy*
Thakur and Srivastava (2014)	774 respondents (current banking and mobile phone customers) in India	TAM and UTAUT	Mobile Payment	Personal Innovativeness	Personal Innovativeness → Adoption Readiness (Perceived Usefulness, **Perceived Ease of Use**, Facilitating Conditions and Social Influence) *
Zarmpou, Saprikis, Markos and Vlachopoulou (2012)	445 individuals in Greece	TAM	Mobile Banking	Trust personal innovativeness	Trust → Perceived Ease of Use* Personal Innovativeness → Perceived Ease of Use*

2.8.4 Determinants of Facilitating Conditions

Facilitating conditions is the perceptual construct which reflects the external situation that creates support or barrier toward the behaviour of an individual. It also refers to the opportunities and resources available to an individual who offer adequate environments for the adoption of certain behaviour (Ajzen, 1991). The main concern of facilitating conditions includes the support and guidance offered by an organisation which assists them in using the innovative technology (Rahi & Ghani, 2018; Saeed, 2011). E-wallet transaction via QR code can be challenging and require that an individual look for assistance in solving the issues. In this study, the researcher will focus on the next sections on the effect of four antecedent of facilitating condition, namely, optimism, innovativeness, discomfort and insecurity.

2.8.4.1 The relationship between optimism and facilitating conditions

Optimism is a kind of personality construct which plays an essential role in the mind of a user in order to cope with difficulties (Carver & Connor-Smith, 2010; Connor-Smith & Flachsbart, 2007). Optimism refers to "an individual difference variable that reflects the extent to which people hold generalised favourable expectancies for their future" (Carver & Connor-Smith, 2010, p. 879). The optimist sees the opportunity in every difficulty. It consists of the ability to handle the difficulties in the way to maintain a sense of balance even if life is difficult. This is supported by Hecht (2013) where the researcher argued that "an optimist selects the positive and reinforcing cues from the environment, and tends to filter and ignore information that does not match his brighter outlook" (p.174-175).

The literature review in Table 2.6 showed that the relationship between optimism and facilitating conditions received almost no attention from the researcher. There is a lack

of studies examines the relationship between optimism and facilitating conditions. However, only Seol *et al*. (2017) used to investigate positive technology readiness and facilitating conditions, and they revealed that it is a significant positive relationship. Also, the study of Sinha *et al*. (2018) have used to integrate the construct of "optimism" inside TR, and the construct of "facilitating conditions" was also intergraded in the construct of "adoption readiness". In their study, they concluded there is a significant relationship between TR and adoption readiness in India.

Thus, this study would like to argue that the previous studies do not demonstrate the relationship of optimism towards facilitating conditions. Hence, this study intended to fill the gaps by examining the relationship of optimism in TR towards facilitating conditions of e-wallet transaction via QR code in Malaysia.

2.8.4.2 The relationship between innovativeness and facilitating conditions

Agarwal and Prasad (1998) argued that persons with high innovativeness are anticipated to build up more positive beliefs regarding technology. There is no doubt that using e-wallet transaction via QR code requires a particular kind of skill, resources and technical infrastructure, where entirely facilities are not usually free in the customer context (Zhou, Lu, & Wang, 2010). Those who are high in innovativeness are open to new ideas and used to identify valuable opportunities and to look for new ways to complete their task. Highly innovative people often consider as leaders and technology forerunners (Sophonthummapharn & Tesar, 2007). The study evaluated that others perceive these individuals as a leader of opinion on the issue of technology (Parasuraman & Colby, 2015). They are keen to take the risk because they are the active seeker of positive new items in order to deal with the ambiguity (Agarwal & Prasad, 1998).

Moreover, Carlsson, Carlsson, Hyvönen, Puhakainen and Walden (2006) argued that facilitating conditions is treated as the guidance and support toward individuals while learning to use new technology services. This includes support from service providers, manufacturers, retailers, friends and families. Therefore, individuals who are innovativeness and intent to use new technology normally will seek for the available resources, and this indicated that personal innovativeness would influence facilitating condition, where they perceived a 'helping hand' in the external environmental conditions (Oliveira *et al*., 2014). Also, the study of Thakur and Srivastava (2014) also proved that personal innovativeness has a significant positive impact on the facilitating conditions in the construct of "adoption readiness" of mobile payments services.

After a review of the literature in Table 2.6, there is a lack of empirical studies that examine the relationship between innovativeness and facilitating condition. Only a few of the studies examine the relationship between positive technology readiness and facilitating conditions (Seol *et al*., 2017). Although the researchers have stated the "innovativeness" in their research, however, they categorised the construct with another construct, namely optimism into positive technology readiness. In general, researchers in the e-wallet field have given no attention to this relationship.

2.8.4.3 The relationship between discomfort and facilitating conditions

Discomfort is a negative feeling of an individual toward technology. Users with high scores on the discomfort scale believe that they will get frustrated because of insufficient technological knowledge (Parasuraman, 2000a). In technological terms, discomfort signifies consumers' anxieties (Guhr *et al*., 2013). For example, when consumers come over for new products or services of technology, they may worry about their ability to use it and believe that this highly specialised technological

product is not designed for them, thereby avoiding the use of such product or service (Sophonthummapharn & Tesar, 2007). As a result, it causes an individual's perception of behavioural control (Venkatesh & Bala, 2008) and perceives that they have less control and support by the facilitating conditions of technology-based services.

From the literature reviewed in Table 2.6, it can be seen that this relationship received poor attention. Only one study had examined the relationship in term of negative technology readiness to represent the two negative feelings, namely, discomfort and insecurity (Seol *et al*., 2017). In their study, the results indicated that the relationship between negative technology readiness and facilitating conditions is found to have a significant and negative impact. In other words, an individual feels more confident and comfortable in adopting the technology service such as e-wallet transaction via QR code when there is the availability of the assistance and guidance offered by the organisation.

2.8.4.4 The relationship between insecurity and facilitating conditions

Insecurity refers to the belief towards the distrust of technology and scepticism about its ability to function correctly (Sophonthummapharn & Tesar, 2007). People who are doubts about the proper functioning of technology are directly related to their personal characteristics. Some people lessen their usage of technology because of the concerns about technology that including security and privacy issues (Liljander *et al*., 2006; Parasuraman & Colby, 2015; Walczuch *et al*., 2007). Security and privacy anxieties undermine technology acceptance (Chen, Gillenson, & Sherrell, 2002; Liljander *et al*., 2006), and therefore insecurity will reduce individual's perception of facilitating conditions and other positive perceptions. As a result, consumers can be suspicious of

new features and decrease their attempts to accept and use the technology (Son & Han, 2011).

By referring to the in Table 2.6, the relationship has not received attention from researchers, especially in the domain of e-wallet transaction via QR code. More specifically, only Seol, Ko and Yeo, (2017) manage to explore the relationship between negative technology readiness and facilitating conditions in the field of sport smart wearable devices in Korea. The significant and negative relationship of negative technology readiness and facilitating conditions are found, where they have integrated both of the negative feelings, namely discomfort and insecurity as negative technology readiness in their study.

Table 2. 6
Some of the Previous Studies Investigating the Antecedents of Facilitating Conditions

Studies	**Subjects**	**Theory/ Model**	**Technology**	**Proposed Antecedents of Facilitating Conditions**	**Findings *Significant, #Insignificant**
Al-Queisi, Dennis, Alamanos and Jayawardhena (2014)	216 users of banking services in the UK	UTAUT	Internet banking	Experience	Experience → Web Design Quality (Technical Quality, General Content Quality, Special Content Quality, Appearance Quality) [refer to facilitating conditions] *
Seol, Ko and Yeo (2017)	534 golf smart wearable devices users in Seoul	UTAUT and TR	Sport smart wearable devices	Positive Technology Readiness (Optimism and Innovativeness) Negative Technology Readiness (Insecurity and Discomfort)	Positive Technology Readiness → Facilitating Conditions* Negative Technology Readiness (-) → Facilitating Conditions*
Sinha, Majra, Hutchins and Saxena (2018)	600 respondents from India	UTAUT and TR	Mobile Payment	**Technology Readiness:** Optimism Innovativeness Insecurity Discomfort	Technology Readiness → Adoption Readiness (Performance Expectancy, Ease of Use, Social Influences and **Facilitating Conditions**) *
Thakur and Srivastava (2014)	774 respondents (current banking and mobile phone customers) in India	TAM and UTAUT	Mobile Payment	Personal Innovativeness	Personal Innovativeness → Adoption Readiness (Perceived Usefulness, Perceived Ease of Use, **Facilitating Conditions** and Social Influence) *

2.8.5 Determinants of Social Influence

Social influence or subjective norm is defined as the perception of social pressure of a person toward to use or not to use technology. Social influence is grounded on commonly shared beliefs on how individual group members should behave in certain circumstances. Human behaviour is manipulated by the perceptions of how members of the social group think and perform (Khalilzadeh *et al*., 2017). Social influence denotes to the extent to which an individual is affected by peers and the institution to accept the technology, as well as the level to which an individual may affect his or her peers to the technology (Singeh *et al*., 2013). In other words, it also can be referred to the user from different personal traits will perceives and aware that their social relationships like family, friends or close peers will try to influence his beliefs that he or she should use a technology (Venkatesh, Viswanath., Thong, James, Y.L. & Xu, 2012). The following sections will focus on the effect of five antecedents of social influence, namely, optimism, innovativeness, discomfort and insecurity.

2.8.5.1 The relationship between optimism and social influence

The positive drivers in theory TRI are optimism and innovativeness that uses to encourage individuals to use technological products or services and have a positive attitude towards technology (Parasuraman, 2000; Parasuraman & Colby, 2015). As defined by UTAUT, social influence is the extent to which other persons who are considered important to him or her think that they must use the technology (Venkatesh *et al*., 2003). Then, a high optimism individual in this environment will highlight the potential benefits of the social interaction of using new technology devices or services (Rojas-Méndez *et al*., 2017).

In this study, after the critical literature was reviewed, as shown in Table 2.7, it was a shred of evidence that this relationship received poor attention from the past researchers. In addition, from the literature reviewed to this point regarding the relationship between optimism and social influence in the other technological context. Not much of the study had addressed the relationship (Seol *et al*., 2017), and the result indicated a significant and positive relationship between positive technology readiness and social influence. However, the relationship between optimism and social influence is not clear enough as the past study only investigate the relationship based on positive technology readiness by combining the construct of optimism and innovativeness in the constructs of 'positive technology readiness'.

2.8.5.2 The relationship between innovativeness and social influence

Innovativeness is an individual trait that demonstrates an individual willing to try a new thing. It is an extent where an individual believes that they are pioneers in trying new technologies and are opinion leaders of others on the technology-related issue (Lin & Hsieh, 2012). It measures how open and receptive an individual is in new technology towards social pressure. It captured the individuals' general perception of technology and perceived that technology is a positive thing from the social environment. In general, innovativeness is measured from an intuitive characteristic in which people at the degree of higher or lower of innovativeness that will get inspiration toward a range of social factors (Martín & Herrero, 2012).

The literature review in Table 2.7 showed that the relationship between innovativeness and social influence received very little attention from the researcher (Seol *et al*., 2017). There is a lack of past studies found that this relationship was significant and positive influence between positive technology readiness (by integrated innovativeness with

optimism) and social influence in the golf smart wearable devices. As the discussion thus far indicates, there are not many researchers have tried to in-depth analyse the relationship between innovativeness and social influence. Therefore, this relationship has not been well understood. In addition, previous studies only recognised positive technology readiness, so that there is an essential concern to carry out the study on the impact of innovativeness on social influence. This study examines these effects of e-wallet transaction via QR code in Malaysia.

2.8.5.3 The relationship between discomfort and social influence

The negative drivers which including discomfort and insecurity in the TRI theory will prevent an individual from adopting the technology (Parasuraman, 2000a; Parasuraman & Colby, 2015). Discomfort is a measure of the degree to which people are generally prejudiced about technology-based products or services as an exception and excludes all types of people (Lin & Hsieh, 2012). This will create their social relationships' beliefs that he or she should not use a technology (Venkatesh, Viswanath., Thong, James, Y.L. & Xu, 2012).

Prior studies in Table 2.7 show that negative technology readiness has negative influences on social influence in Korea (Seol *et al*., 2017). It would discourage people from using sport smart wearable devices if an individual perceived a negative influence in their society. Thus, from the literature review, it can be summarised that the influence of discomfort on social influence receiving extremely poor attention from past researchers, especially for e-wallet transaction via QR code.

2.8.5.4 The relationship between insecurity and social influence

Insecurity refers to an individual's distrust of technology and scepticism about its good in the use of technology (Lin & Hsieh, 2012). Because social influences generate social pressure from the external environment of the individual, their technology readiness's belief might influence their perceptions and behaviours in taking certain actions such as the opinions of friends, relatives and superiors (Tarhini *et al*., 2016).

In Table 2.7, it is obvious that the in-depth relationship between insecurity and social influence is needed to examine in the domain of e-wallet transaction via QR code in Malaysia. Although the past study indicates that the construct of 'negative technology readiness' has a significant negative impact on the social influence (Seol *et al*., 2017), however, the individual construct of 'insecurity' in TRI need to be examined.

Table 2. 7
Some of the Previous Studies Investigating the Antecedents of Social Influence

Studies	**Subjects**	**Theory/ Model**	**Technology**	**Proposed Antecedents of Social Influence**	**Findings *Significant, #Insignificant**
Seol, Ko and Yeo, (2017)	534 golf smart wearable devices users in Seoul	UTAUT and TR	Sport smart wearable devices	Positive Technology Readiness (Optimism and Innovativeness) Negative Technology Readiness (Insecurity and Discomfort)	Positive Technology Readiness → Social Influence* Negative Technology Readiness (-) → Social Influence*
Sinha, Majra, Hutchins and Saxena (2018)	600 respondents from India	UTAUT and TR	Mobile Payment	**Technology Readiness:** Optimism Innovativeness Insecurity Discomfort	Technology Readiness → Adoption Readiness (Performance Expectancy, Ease of Use, **Social Influences** and Facilitating Conditions) *
Thakur and Srivastava (2014)	774 respondents (current banking and mobile phone customers) in India	TAM and UTAUT	Mobile Payment	Personal Innovativeness	Personal Innovativeness → Adoption Readiness (Perceived Usefulness, Perceived Ease of Use, Facilitating Conditions and **Social Influence**) *

2.8.6 Possible Mediating Role of Performance Expectancy and Effort Expectancy

Specifically, this study aims to investigate the mediating influences of performance expectancy and effort expectancy on the relationship between behavioural intention to use e-wallet transaction via QR code, and the constructs on TRI, namely optimism, innovativeness, discomfort and insecurity. The motivation of this study is driven by the inconsistent findings in the literature concerning the relationships between behavioural intention to use e-wallet transaction via QR code, and all of the constructs on TRI. In line with the inconsistencies, various suggestions have emerged, pointing to the need to investigate the possible mediating variables that could explain the inconsistencies (Sekaran & Bougie, 2010).

By referring to the study of Chien-Hsin Lin *et al*. (2005), the study examines about the technology readiness (TR) and technology acceptance model (TAM), and the impact of TR theory on the user of intention is fully mediated by the perceptions of usefulness. The research hypotheses and the integrated framework were verified and established by web-based survey data which located in Taiwan. TR was theorised to be a causal antecedent of perceived usefulness in TAM, which then it influences the user's intention to use the e-service. Perceived usefulness will have a complete mediating effect between technology readiness and consumers' use intentions (Lin & Hsieh, 2006).

According to Pattansheti, Kamble, Dhume and Raut (2016), they give a clue towards individual differences is because of the distinctive psychological traits that are mediated by the cognitive dimensions such as perceived usefulness or performance expectancy in predicting people's acceptance of the technology. Therefore, the present

study considers performance expectancy as a mediating variable between antecedents of performance expectancy of this study and behavioural intention to use e-wallet transaction via QR code in Malaysia. To build a consistent argument, this section will provide previously made arguments that are consistent with the researcher's opinion about the choice of performance expectancy as a mediating variable to behavioural intention (please refer to Table 2.8).

The findings of performance expectancy mediate the relationship between effort expectancy and behavioural intention has been validated and confirmed through TAM and UTAUT based studies. Previous researches have validated the role of performance expectancy (also known as perceived usefulness in TAM) as an intervening construct empirically (Al-Jabri & Roztocki, 2015; Al-Queisi *et al*., 2014; Ayeh, 2015; BasGöze, 2015; Casey & Wilson-Evered, 2012; Khalilzadeh *et al*., 2017; Lim *et al*., 2018; Mohammadi, 2015a, 2015b; Sinha *et al*., 2018; Tan & Lau, 2016; Zhou, 2011; Zhu, Chang, Luo, & Li, 2014). For instance, if there is no performance expectancy, the effort expectancy is expected to have a significant influence on the use of online banking. Though, when performance expectancy is used as the mediator, the expected impact of the effort on the use of online banking becomes less significant. Therefore, performance expectancy plays a mediating role in the long-term impact of using online banking (Al-Queisi *et al*., 2014).

On the other hand, grounded on the UTAUT, the role of performance expectancy as a mediating variable has not been widely examined compare to the perceived usefulness in TAM. Despite that, according to the study of BasGöze (2015), they examined the mediating effect of perceived usefulness on the relationship between technology readiness and mobile shopping. In this study, they found out perceived usefulness has

a partial mediation between technology readiness and mobile shopping. However, the study had included all of the TRI constructs, namely optimism, innovativeness, discomfort and insecurity into one variable, which is Technology Readiness. Therefore, this is a large gap in previous studies that have not been addressed yet. Thus, the relationships between four of the TRI constructs and behavioural intention with the mediation effect of performance expectancy are still unclear.

According to the study of Sinha *et al*. (2018), they used to provided study about Indian customers' intentions to utilise mobile payments by checking if they are ready to have adoption readiness (AR) for higher technical readiness (TR). In their research, all four UTAUT construct, namely performance expectancy, effort expectancy, facilitating conditions and social influence are integrated into one construct, namely AR. To examine the hypothesis that AR mediates the relationship between TR and intention to use technology, the mediation model is calculated by the bootstrapping approach in AMOS, as described using 5,000 bootstrapping samples. The results indicate that there is a significant indirect effect of AR. Therefore, they discovered that the higher AR would generate greater intention to use the technology. However, as shown in the following Table 2.8, it was a shred of evidence that the effort expectancy act as mediator received poor attention from the past researchers.

Table 2. 8
Previous Empirical Studies that Examine the Mediating Role of Performance Expectancy and Effort Expectancy

Author and year	Mediating Variable	Endogenous Variable	Exogenous Variable	Mediation Result
Al-Queisi *et al*. (2014)	Performance expectancy	Internet banking usage	Web design quality	Mediation Established
Al-Jabri and Roztocki (2015)	Perceived usefulness	Attitude towards system use ERP systems	Perceived information transparency	Mediation Established
Ayeh (2015)	Usefulness	Intention to use consumer-generated media	Trustworthiness	Mediation Established
BasGöze (2015)	Perceived usefulness	Mobile Shopping	Technology readiness	Mediation Established
Casey and Wilson-Evered (2012)	Performance expectancy	Behavioural Intention to use online family dispute resolution services	Personal web innovativeness	Mediation Established
Khalilzadeh *et al*. (2017)	Utilitarian performance expectancy	Attitude toward using NFC based mobile payment	Effort expectancy	Mediation Established
Lim, Ahmad, and Talib (2018)	Performance Expectancy	Behavioural Intention	Effort expectancy	Mediation Partially Established
Mohammadi (2015a)	Perceived usefulness	Users' attitudes toward mobile banking	Ease of use	Mediation Established
Mohammadi (2015b)	Perceived usefulness	Intention to use e-learning	Perceived ease of use	Mediation Established
Sinha, Majra, Hutchins and Saxena (2018)	**Adoption Readiness:** Performance Expectancy Ease of Use Social Influences Facilitating Conditions	Intention to Adopt	**Technology Readiness:** Optimism Innovativeness Insecurity Discomfort	Mediation Established
Tan and Lau (2016)	Performance expectancy	Intention to adopt mobile banking	Effort expectancy	Mediation Established
Zhou (2011)	Perceived usefulness	Usage intention of mobile banking	Information quality System quality	All Mediation Established

			Structural assurance Initial trust	
Zhu, Chang, Luo and Li (2014)	Perceived usefulness	Adoption intention on social networking sites	Perceived effort Perceived accuracy Perceived special treatment Perceived social benefit	Mediation Established No Mediation Mediation Established Mediation Established

Based on the critical literature review above, the investigating of the mediating role of performance expectancy and effort expectancy on the relationship between the constructs on TRI, and behavioural intention is still relevant for three reasons. First, the behavioural intention to use technology depends on the factors that have direct effect on performance expectancy (Al-Jabri & Roztocki, 2015; Al-Queisi *et al*., 2014; Ayeh, 2015; BasGöze, 2015; Casey & Wilson-Evered, 2012; Khalilzadeh *et al*., 2017; Mohammadi, 2015b, 2015a; Tan & Lau, 2016; Zhou, 2011; Zhu *et al*., 2014).

Second, there is lack of studies in the field of e-wallet transaction via QR code, particularly those study that determine the significant factors that influence directly on performance expectancy and effort expectancy to behavioural intention to use e-wallet transaction via QR code (Tan & Lau, 2016; Zhou, 2011). Third, the relationships between behavioural intention to use innovative technology, and effort expectancy in the banking's field is inconsistent (Afshan & Sharif, 2016; Faria, 2013; Gu *et al*., 2009; Hanafizadeh *et al*., 2014; Karma *et al*., 2014; Oliveira *et al*., 2014; Tan & Lau, 2016; Tobbin, 2012; Zuiderwijk *et al*., 2015), and the relationships between behavioural intention and the constructs on TRI also has inconsistent findings in the literature (BasGöze, 2015; Dimitriadis & Kyrezis, 2010; Escobar-Rodríguez & Carvajal-Trujillo, 2014; Lin & Chang, 2011; Rojas-Méndez *et al*., 2017; Seol *et al*., 2017).

Thus, this study contends that it is appropriate to consider the effect of the main drivers of performance expectancy and effort expectancy, thereby justifying the investigation of the mediating role of performance expectancy and effort expectancy on the relationship between the constructs on TRI (optimism, innovativeness, discomfort and insecurity), and behavioural intention to use e-wallet transaction via QR code in the Malaysia's context.

Due to the fact that mediation result is ambiguous, and also the mediating effect of performance expectancy and effort expectancy on the relationship between optimism, innovativeness, discomfort and insecurity, to behavioural intention to use has received poor attention from past studies in the setting of e-wallet transaction via QR code. There is a need for further validation of the mediating role of performance expectancy and effort expectancy. This will bridge the existing gap especially in IT and IS literature. Consequently, the current research is interested in contributing toward this issue by considering it in the setting of e-wallet transaction via QR code in Malaysia.

2.8.7 Moderating Role of Facilitating Conditions and Social Influence

Precisely, this study aims to investigate the moderating role effects of facilitating conditions and social influence on the relationship between behavioural intention to use e-wallet transaction via QR code, and the constructs on TRI, namely optimism, innovativeness, discomfort and insecurity. In fact, the UTAUT posits the role of four moderating variables, namely, gender, age, experience and voluntariness of use (Venkatesh *et al*., 2003). However, there is not much research on the moderating influence of facilitating condition and social influence in behavioural intention to use e-wallet up to now.

According to the prior studies from Hoque (2016), Kishore and Sequeira (2016), Olavide (2012), and Riquelme and Rios (2010), they have examined the gender as the moderating variable in their study. According to Olavide (2012), given the gender differences, if you want to involve them in the mobile trade, it's clear that you need to treat men and women differently. This is because, depending on gender, individuals respond differently to external stimuli. In terms of licensing marketing as an external provocation, men show a higher sensitivity than women, perhaps because they want more control over the use of personal information and can lead us to believe that male consent will be more likely to expand beyond female consent. Similarly, in the case of women, the perceived risks hinder participation and have no significant effect on men. For women, this defined risk turns into greater uncertainty in the buying process and greater media anxiety, as they are more valuable than men for physical purchases based on a larger entry point than traditional channels.

Additionally, Riquelme and Rios (2010) sought to test factors that may influence the use of mobile banking and gender as moderators in current internet banking users in Singapore. The sample is prejudiced against people now using the internet for banking. Though, mobile banking inventors may not be particularly internet banking users today. As gender shows a moderating role in the perception of ease of use, relative advantage and social norms, it is recommended that companies determine communication strategies based on gender. Social norms are more precious to women than men and ease of us, while relative advantages are more crucial to men. This study used gender as a moderator and risk as an independent variable, which was rarely measured in earlier findings.

Table 2. 9
Previous Empirical Studies that Examine the Moderating Role

Author and year	Moderating Variable	Endogenou Variable	Exogenous Variables	Moderating Effect
Hoque (2016)	Gender	Intention to use	Perceived usefulness Perceived ease of use Subjective norm Personal innovativeness	Yes
Riquelme and Rios (2010)	Gender	Adoption of mobile banking	Perception of ease of use Social norms Relative advantage Risk	Yes (except Risk)
Olavide (2012)	Gender	Involvement in Mobile Purchasing	Perceived risk Permission marketing and propensity to use new information technologies	Yes (excluded Propensity to use new information technologies)
Kishore and Sequeira (2016)	Gender and Age	Behavioural intention	Performance expectancy Effort expectancy Social influence Attitude	Gender and Age: Yes, for attitude only
Baptista and Oliveira (2015)	Individualism/ collectivism Uncertainty avoidance Long/short term Masculinity/ femininity Power distance	Use behaviour	Behaviour intention	Yes (excluded Masculinity/femininity)

According to the research of Baptista and Oliveira (2015) in Table 2.9, combined with the acceptance and use of the unified technical technique (UTAUT2) of Venkatesh *et al*. (2012), the proposed theoretical model is unique and cultural moderator by Hofstede (1980) described the acceptance of mobile banking. It is found that cultural moderators have a great impact on behavioural intention, namely individualism/collectivism, uncertainty avoidance, long/short term and power distance.

According to the survey of Baptista and Oliveira (2015), the research model confirms the influence of four of Hofstede's cultural moderator on behavioural intentions of behaviour. Individualism/collectivity has a robust and constructive regulatory role. Uncertainty avoidance has significant moderate effects as it is counterintuitive and may be the direct result of studying artefacts or sample characteristics, in line with Mozambique's uncertainty avoidance factor index, which classifies Mozambique as a very low uncertainty area (Hofstede Insights, 2019). People who have this cultural identity are relaxed, less risk-taking, often innovated, and more receptive to new ideas, new products and services. Whether it involves mobile banking, technology or business practices, it can be considered a movement that generates positive emotions that are often negative in other cultures.

In addition, long-term/short-term effects have strong negative control, statistically significant power distance, and there are positive signs of impact on on the influence of intention overuse (Baptista & Oliveira, 2015). The result of the effects of moderating of cultural factors is consistent with Hofstede's collectivism towards Mozambique, the avoidance collectivist, low uncertainty avoidance, high power distance, and short-term region. Still, it has been found that membership/femininity is less important in terms of behavioural intentions than it is about behavioural use. According to the Hofstede cultural classification index for Mozambique, individuals with this cultural identity value equalities, unities quality of lives and concern for others. The importance of this relationship is not high, probably because mobile banking is not seen as a crucial service or a way to achieve this lifestyle. Therefore, the argument creates gaps in Malaysia in whether facilitating conditions and social

influence moderate the personal traits on behavioural intention to use e-wallet via QR code in Malaysia.

2.9 Theoretical Framework

Theoretical framework refers to how a particular phenomenon or variables or concept are related to each other in a model, and the beliefs of explanation why these variable are related to each other (Sekaran & Bougie, 2010). This study uses to combine technology readiness with the user perceptions of technology as they play a significant role in the decision to use e-wallet transaction via QR code. A holistic research model is proposed in this study, that is theoretically grounded on two well-established theories, namely UTAUT and TRI model by giving the theoretical basis to investigate the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.

The studies of technology acceptance used to measure IT as an evolving emerging domain. The principles that assisted its improvements are either system focused or beliefs focused (Afshan & Sharif, 2016). In order to examine the determinants that affect the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia, this study will use an integrative approach by incorporating the factors from TRI into UTAUT. This is because recent empirical studies suggested that the integration of different models is important to get more understanding toward the acceptance of technology (Afshan & Sharif, 2016; Oliveira *et al*., 2014; Oliveira & Martins, 2011). The studies are concerned about the coupling of various theoretical models to study the behavioural intention to use a technology (Afshan & Sharif, 2016; Oliveira *et al*., 2014). Thus, this study aims to explore the behavioural intention of using e-wallet transaction via QR code among M40 millennials in Malaysia through

the integration of the TRI (Parasuraman, 2000a) and UTAUT framework (Venkatesh *et al*., 2003). As illustrated in Figure 2.3, the framework consists of:

Exogenous Variables: Optimism, innovativeness, discomfort and insecurity.

Endogenous Variables: Effort expectancy, performance expectancy, behavioural to use e-wallet transaction via QR code.

Mediating Variable: Performance expectancy, effort expectancy.

Moderating Variable: Facilitating conditions, social influence.

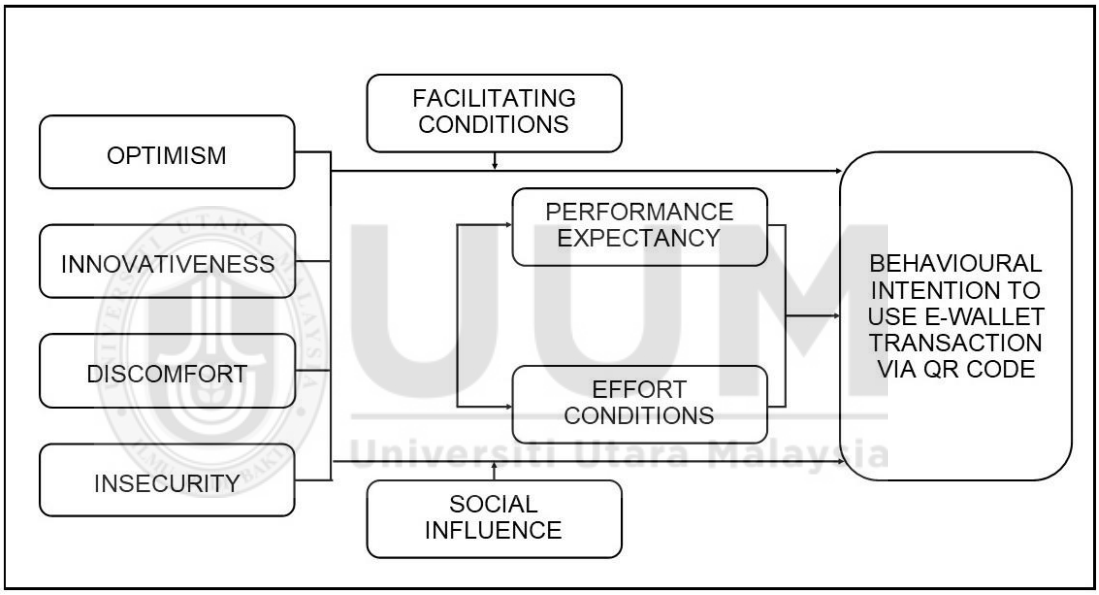


Figure 2. 3: Research Model: E-Wallet Transaction via QR Code Acceptance Model

The research framework model for this study has been developed, as shown in Figure 2.3. This model showed that behavioural intention is the main endogenous variable. The determinants (antecedents) of behavioural intention to use e-wallet transaction via QR code are effort expectancy, performance expectancy, optimism, innovativeness, discomfort and insecurity. Moreover, there are four antecedents for effort expectancy and performance expectancy, namely optimism, innovativeness, discomfort and insecurity. Also, the model shows that the antecedents of performance expectancy are optimism, innovativeness, discomfort and insecurity. Additionally, performance

expectancy and effort expectancy also act as a mediator in this study. Besides that, facilitating conditions and social influence acts as a moderator in this study.

Parasuraman (2000) recommends that organisations can employ TRI to obtain an in-depth insight of the readiness of their potential customers, in order to understand their acceptance and interaction with technology (Sophonthummapharn & Tesar, 2007). Organisations always have an interest in understanding and attempting to understand how personality affects an individual's consumption behaviour.

The are several reasons for this study is to combine TRI with UTAUT as follows. First, UTAUT and TRI can be applied to describe technology acceptance (Davis, 1989; Parasuraman, 2000b). Next, the most important difference between the two models is that UTAUT utilises system-specific perceptions to clarify the technology acceptance, whereas the TRI clarify the general feeling or perception of an individual (Kuo *et al*., 2013; Yi, Tung, & Wu, 2003). It is theoretically suitable for integrating UTAUT with TRI. Therefore, when measuring the customer acceptance of technology-based services, TR cannot be ignored, and its part should be interpreted and integrated into any technology acceptance model, particularly in the determination of self-service technology (Lin & Chang, 2011). Hence, this study fills this gap by integrating TRI and UTAUT as user personality factors in predicting people's acceptance of technology in the context of e-wallet transaction via QR code in Malaysia.

2.10 Research Hypotheses

A hypothesis is a formal proposition of legitimately speculated relationship between numerous variables, which depends on the philosophy of research framework that is empirically measurable to locate a predictable solution for the problem statement

(Sekaran & Bougie, 2013). Based on the research model that showed in Figure 2.1 and the literature review, thirty hypotheses have been formulated to test the model. The following sections discuss in detail the hypotheses in the research model, which are classified as follows:

2.10.1 Behavioural Intention

Behavioural intention is the strength of an individual's intention to complete a certain behaviour (Fishbein & Ajzen, 1975). There is very sensitive to individual differences in this distinctive environment. This is because the decision to use technology depends heavily on personal judgments and personal desires. Thus, measuring and classifying individual psychological and mental characteristics to value new technology is needed to integrate the constructs in TRI. Personality traits which including optimism, innovativeness, discomfort and insecurity of a consumer may affect customer acceptance of self-service technologies such as e-wallet transaction via QR code.

Technology readiness is defined as an individual's general technological opinion and the consumers' desire to use the technology (Parasuraman, 2000a). When an individual intends to use new technology, the particular individual will generate positive or negative feelings about the particular technology. These feelings can be support under the construct in the theory of TRI, namely optimism, innovativeness, discomfort and insecurity (Parasuraman, 2000a; Parasuraman & Colby, 2015). M40 millennials' positive feelings can be specified by innovativeness and optimism, while discomfort and insecurity represent negative feelings about the technology. Consequently, it is appropriate to investigate the effect of optimism, innovativeness, discomfort and insecurity on the behavioural intention to use e-wallet transaction via QR code in Malaysia. Therefore, this study proposes the following hypotheses:

H1a: *Optimism has a positive effect on the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

H1b: *Innovativeness has a positive effect on the behavioural intention to e-wallet transaction via QR code among M40 millennials in Malaysia.*

H1c: *Discomfort has a negative effect on the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

H1d: *Insecurity has a negative effect on the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

Next, performance expectancy reveals to a person in using technology will improve their performance (Venkatesh *et al*., 2003). Performance expectancy implies that people will use e-wallet transaction via QR code if they believe that it will bring up positive consequences (Compeau & Higgins, 1995; Gupta *et al*., 2019). It is important to inspire banking consumers to adopt more innovative technologies that create value for them in performing transactions (Mohammadi, 2015a). Consequently, the willingness of M40 millennials to perform a behaviour can be examined by his or her effort expectancy and performance expectancy. In this study, as the e-wallet transaction via QR code is relatively new in Malaysia, accordingly, the behavioural intention is used to explain how great the among M40 millennials' desire to use e-wallet transaction via QR code. In view of the above argument, the hypotheses are proposed as follows:

H1e: *Performance expectancy has a positive effect on the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

H1f: *Effort expectancy has a positive effect on the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

2.10.2 Performance Expectancy

Performance expectancy can be conceptualised as the perceived benefits and values that could be gain from the use of technology (Venkatesh *et al*., 2003). Kuo *et al*. (2013) and Walczuch, Lemmink and Streukens (2007) stated that optimists perceive technology to be more useful and easier to use because they are less worry about negative effects. Optimists also have a smaller degree of contradicting perceptions that will weaken the use of technology (Matthing *et al*., 2006; Walczuch *et al*., 2007). Besides, it can be argued that innovators have a preference for problem-solving, and they are expected to take benefit of their knowledge and abilities in order to use the technology. Furthermore, innovators incline to think that they will lose something if they do not use the new technology. They are keen to take a risk on the use of new technology even there is ambiguous or invisible of benefits (Walczuch *et al*., 2007).

However, individuals who are sceptical about the ability to use technology to function correctly are directly related to their personal characteristics. Some individuals avoid using technology because of their inherent fears of the usefulness of the technology. Individuals who have a high degree of discomfort toward new technologies have a tendency to discover technology to be less usefulness (Walczuch *et al*., 2007). Highly discomfort consumers do perceive the new technology are more complicated and frequently leads to frustration and disappointment (Mick & Fournier, 1998). Moreover, security and privacy anxieties will also weaken technology acceptance, and consequently reduce its perceived usefulness and other positive perceptions (Davis, 1989; Walczuch *et al*., 2007). Hence, this study articulates the following hypotheses:

H2a: *Optimism has a positive effect on the performance expectancy of e-wallet transaction via QR code among M40 millennials in Malaysia.*

H2b: *Innovativeness has a positive effect on the performance expectancy e-wallet transaction via QR code among M40 millennials in Malaysia.*

H2c: *Discomfort has a negative effect on the performance expectancy e-wallet transaction via QR code among M40 millennials in Malaysia.*

H2d: *Insecurity has a negative effect on the performance expectancy of e-wallet transaction via QR code among M40 millennials in Malaysia.*

2.10.3 Effort Expectancy

Effort expectancy is the perception of the customer towards the ease or difficulty to use e-wallet transaction via QR code. Due to the e-wallet transaction via QR code has the certain nature which an individual needs to have a certain degree of skill and knowledge to use, effort expectancy can play an essential role to determine the customer's perceived ease of use of this technology (Alalwan *et al*., 2017).

In general, consumers who think optimistically and innovatively in new technology will tend to show positive attitudes about new technologies. There are two motivators of technology readiness, namely optimism and innovativeness. It is well-known that there is a positive relationship between optimism and innovativeness, and perceived ease of use as shown in other contexts (Kuo *et al*., 2013; Shin & Lee, 2014). But there are two technology readiness inhibitors which are discomfort and insecurity. These discomfort and security issues are also important for those who want to use new technology, particularly financial transaction systems. In prior empirical studies, people who believe and feel discomfort and insecurity would negatively affect the consumer's perceived ease of use (Kuo *et al*., 2013). Perception of the discomfort and insecurity will be a barrier of M40 millennials to see new technologies to be easy to use. Thus, it is expected that:

H3a: *Optimism has a positive effect on the effort expectancy of e-wallet transaction via QR code among M40 millennials in Malaysia.*

H3b: *Innovativeness has a positive effect on the effort expectancy of e-wallet transaction via QR code among M40 millennials in Malaysia.*

H3c: *Discomfort has a negative effect on the effort expectancy of e-wallet transaction via QR code among M40 millennials in Malaysia.*

H3d: *Insecurity has a negative effect on the effort expectancy of e-wallet transaction via QR code among M40 millennials in Malaysia.*

2.10.4 The Performance Expectancy and Effort Expectancy as Mediator

Existing literature indicates that the gap still exist in the field of IT and IS, especially when identifying key factors that have a direct influence on performance expectation and effort expectancy on the behavioural intention (Ayeh, 2015; BasGöze, 2015; Lim *et al*., 2018; Mohammadi, 2015b; Sinha *et al*., 2018; Tan & Lau, 2016; Zhou, 2011; Zhu *et al*., 2014). In this regard, the indirect relationship between optimism, innovativeness, discomfort, and insecurity, and behavioural intention through performance expectancy expectation and effort expectancy have received poor attention in the past studies, and there is lack of detail relationship that has been previously explored, and there is a need to formulate an indirect hypothesis (Sekaran & Bougie, 2010).

Therefore, in line with many researchers (Al-Jabri & Roztocki, 2015; Al-Queisi *et al*., 2014; Ayeh, 2015; BasGöze, 2015; Casey & Wilson-Evered, 2012; Khalilzadeh *et al*., 2017; Lim *et al*., 2018; Mohammadi, 2015b, 2015a; Sinha *et al*., 2018; Tan & Lau, 2016; Zhou, 2011; Zhu *et al*., 2014), the present study proposes that performance expectancy and effort expectancy plays a significant and positive mediating role in

the relationship between optimism and innovativeness, and behavioural intention to use e-wallet transaction via QR code. Also, this study proposes the performance expectancy and effort expectancy will mediate the negative relationship between discomfort and insecurity, and behavioural intention to use e-wallet transaction via QR code. Thus, this study attempts to carry out this investigation in order to enrich IT and IS works of literature in this aspect being the first to make this investigation. Thus, the formulation of this hypothesis:

H4a: *Performance expectancy has a significant and positive mediating effect on the relationship between optimism and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

H4b: *Performance expectancy has a significant and positive mediating effect on the relationship between innovativeness and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

H4c: *Performance expectancy has a significant and negative mediating effect on the relationship between discomfort and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

H4d: *Performance expectancy has a significant and negative mediating effect on the relationship between insecurity and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

H4e: *Effort expectancy has a significant and positive mediating effect on the relationship between optimism and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

H4f: *Effort expectancy has a significant and positive mediating effect on the relationship between innovativeness and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

H4g: *Effort expectancy has a significant and negative mediating effect on the relationship between discomfort and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

H4h: *Effort expectancy has a significant and negative mediating effect on the relationship between insecurity and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

2.10.4 The Facilitating Conditions and Social Influence as Moderator

There is not much research on the moderating effect of facilitating condition and social influence in behavioural intention to use e-wallet up to now. The extent of the literature reveals that there is a gap that remains in the field of e-wallet transaction via QR code. In fact, the UTAUT model recognises that the construct of facilitating conditions will reflect the perception of an individual towards control over the behaviour (Ghani, 2018); Venkatesh, Brown, Maruping, & Bala, 2008). As mentioned earlier, facilitating conditions are the perceptions of the availability of resources and support to perform the behaviour. In TRI, personal technology readiness is being encouraged by optimism and innovativeness but undermined by discomfort and insecurity.

Positive and negative beliefs towards technology might exist together for their personal judgment (Lin, Chen, Lin, & Chen, 2007). An individual who has an optimistic view of technology will positively cope with all the difficulties in their facilitating environment. Moreover, innovativeness is related to a propensity to become a technology explorer. In fact, consuming online payment channels such like e-wallet transaction via QR code often requires distinct support facilities such as resources, skill, and technical infrastructure to efficiently apply and use this technology (Alalwan *et al*., 2017). Individual who are innovativeness are willing to

take the risk as they are active explorers of searching for something new and able to deal with uncertainty conditions positively (Agarwal & Prasad, 1998).

However, the feeling or belief of discomfort is associated with the perception of the absence of control of technology, and the feeling of being troubled (Parasuraman, 2000a). The discomfort of individual will have a perception where they may feel unfamiliar with e-wallet transaction via QR code and believe that the availability of resources and supports around them is not sufficient. This will make them feel depressed and anxieties, and thus having a perception of cannot use e-wallet transaction via QR code comfortably. Additionally, insecurity comprises of not trusting technology and having uncertainties toward its ability to function properly (Parasuraman, 2000a; Parasuraman & Colby, 2015). If there is the more insecurity that an individual possesses, the less facilitating conditions towards e-wallet transaction via QR code are perceived by an individual. Subsequently, the consumers become suspicious of the new technology and reduce interaction with their facilitating conditions (Son & Han, 2011).

In the context of e-wallet, facilitating conditions are considered as something that glued the relationships between the technology and the individuals. Thus, in this study, it is hypothesised that when individual perceived high facilitating conditions regardless of how their positive and negative beliefs which including their optimism, innovativeness, discomfort and insecurity; their behavioural intention to use e-wallet transaction should be higher. Therefore, the followings hypotheses are raised:

H5a: *Facilitating conditions moderates the relationship between optimism and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

H5b: *Facilitating conditions moderates the relationship between innovativeness and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

H5c: *Facilitating conditions moderates the relationship between discomfort and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

H5d: *Facilitating conditions moderates the relationship between insecurity and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

Next, social influence can be conceptualised as the environmental and social impact of the intentions of the customer to perceive the use of e-wallet transaction via QR code. Social influence is the perceived behavioural expectations from their essential personnel in the consumer's life (Venkatesh *et al*., 2003). In other words, the encouragements and information are given by the social environment able to play an active role in promoting customer awareness and technology intentions (Alalwan *et al*., 2017). It is expected that this personal belief determines the prevailing subjective norms, which the perceived social pressure from them to act on or not to act in a behaviour (Venkatesh *et al*., 2003).

The optimists will choose positive hints from the environment (Hecht, 2013). They will tend to filter and ignore the information that is unable to fit their social pressure. Optimists are less likely to concern the negative perception of their social environment, and they face technology more openly and innovatively. Also, innovativeness of an individual having a broad range of technical knowledge and confidence that they can operate the new technology independently. Innovators incline to perceive social

pressures actively and are more willing to try any new technology (Walczuch *et al*., 2007).

On the other hands, consumers who are filled with a high level of discomfort may think that they are lacking technical knowledge, and as a result, they may feel frustrated in social pressure. Thus, it represents consumers anxiety over technology (Sophonthummapharn & Tesar, 2007). Consumers who feel insecurity do not believe in technology products and suspicions about implementing technological products through their work (Parasuraman, 2000a). Personal doubt of technology will react to his or her social pressure negatively as a personal feeling of insecurity causes individuals to avoid using technology due to an innate fear of technology (Kwon & Chidambaram, 2000). This feeling may arise from their personal sceptical of new technologies (Walczuch *et al*., 2007).

In the context of e-wallet, social influence is considered as that bonded the relationships between the individual and the technology. Hence, in this study, it is hypothesised that when individual perceived strong social influence regardless of how they are feeling or belief of their optimism, innovativeness, discomfort and insecurity; their behavioural intention to use e-wallet transaction should be higher. Consequently, this study suggests the following hypothesis:

H5e: *Social influence moderates the relationship between optimism and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

H5f: *Social influence moderates the relationship between innovativeness and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

H5g: *Social influence moderates the relationship between discomfort and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

H5h: *Social influence moderates the relationship between insecurity and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.*

2.11 Summary

The conceptual explanation of each construct is illustrated in this chapter. The researcher studied the theories and models of technology acceptance field in order to recognise the most suitable theoretical framework for this study. The reviewed literature lays the foundation for developing a model that measures the factors that influence behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. Based on previous studies, the theoretical research framework developed based on UTAUT and TRI. There are thirty hypotheses presented and developed from prior studies.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research methodology that applies to this study. This chapter divided into research design, research instrument, population and sampling, data analysis techniques, the rationale behind choosing Partial Least Squares Structural Equation Modelling (PLS-SEM), pilot-test study and summary.

3.2 Research Design

The research design refers to the research layout for the information collection and evaluation of the necessary information. It is a set of options to accomplish the objectives of the research, answer the research questions and verify the hypotheses of the research (Sekaran & Bougie, 2013). These options can use to manage the questionnaire design, data collection techniques, instrument scale, determine the sampling size and data analysis procedures. Effective, the high-quality research design should be able to justify the decisions that have been taken.

This research uses a quantitative approach to research design. It aims to gather data to answer the research questions and to explore the objectives of this study. It is believed that quantitative research method is the best method because it is used to understand the relationship between measurable variables and with a purpose to predict, explain and manage the situation. Moreover, the approach of quantitative research is very

suitable to analyse and prove theories, determine important determinants for future study and relate determinants that presented in research questions or hypothesis by using the criteria of validity and reliability, and statistical measures (Creswell, 2014). This study conducted using a quantitative approach to investigate the determinants that manipulating the behavioural intention to the e-wallet transaction via QR code in Malaysia.

In this study, quantitative research is defined as a method by collecting data through a survey by applying the self-administered questionnaire at one specific point in time. A survey method is ideal because it can summarise the population in a shorter period of time and enable researchers to cover much broader geographic locations and remove the existence of interview bias (Bryman & Bell, 2011). Also, the survey technique allows the researcher to obtain data from a big number of individuals at a lower cost compare to other techniques. It consumed lesser time and more efficient to obtain data on a big scale of the population.

Base on the guideline from Cooper and Schindler (2011), there is a total of three kinds of survey, namely self-administered, telephone, and personal interview. Among three of these techniques, the self-administered survey was selected as the data collection technique for this study. The justification in the back of the choice of a self-administered survey is the potential of this technique to attain a larger sample compared to other techniques (Cooper & Schindler, 2014). Besides, the cost involved in a self-administered survey is less expensive compared to an interview and telephone survey. This technique still considers cheaper than other techniques, although it provides a wider geographical area (Bryman & Bell, 2011). Furthermore, aspects including save time to manage, respondents can answer more convenience, and it also

avoids the presence of an interview effect are further advantages for a self-administered survey (Bryman & Bell, 2011).

As the data were obtained at a single point in time for this study (Zikmund, Babin, Carr, & Griffin, 2010), the study was cross-sectional. The researcher chooses to employ the cross-sectional-quantitative research approach for several reasons. First, the cross-sectional method was chosen because this study focused on the measurement of the variables of the proposed model based on individuals' perceptions of e-wallet transaction via QR code. By nature, cross-sectional studies provide a snapshot in contrast to a longitudinal study; the main objective of the longitudinal study is the measurement of the differences between individuals' perceptions over two or more periods of time. Second, this research is behavioural in nature, as the purpose is to measure the behavioural intention to use e-wallet transaction via QR code. As a result, a large survey was used to generalise the findings (Saunders, Lewis, & Thornhill, 2008). Third, this option was found appropriate because the primary goal of the study was a validation of the proposed model and in consideration of resource constraints of the researcher including time and money available to the researcher (Sekaran & Bougie, 2013).

Zikmund *et al*. (2013) divided research design into three types, exploratory research, causal or hypothesis testing research and descriptive research (Zikmund *et al*., 2010). Moreover, Sekaran and Bougie (2013) confirmed three kinds of research design depending on the field to which knowledge about the research topic has advanced, namely descriptive, exploratory and hypothesis testing design. The focal point of the exploratory study is collecting as much information as possible to understand the new bases of research. This type of research design does not seem to be the intended design

for the current research. In addition, descriptive study is undertaken to verify and describe specific characteristics of the researched variables (Sekaran & Bougie, 2013). The objective of the descriptive study, therefore, is to depict a precise profile of individuals, incidents, phenomena or situations (Zikmund *et al*., 2010). Hence, this research design is not the type that the current research is looking to adopt, as it is inappropriate for the research aims.

Researchers who employ hypothesis testing usually attempt to explain the nature of specific relations or to interpret the variance in the endogenous variables; which occurs as a result of other variables' effect (Sekaran & Bougie, 2013). This is a correlational study, where the objective of the correlational study is to examine the hypotheses of the relationships between exogenous variables and endogenous variable and provides evidence for or against the relationships in order to understand the phenomena of relationships among existing variables. Thus, it is used to test the direction and strength of the relationships between different variables, to amend or support the original theory (Cohen, Manion, & Morrison, 2011; Kothari, 2004). According to Kothari (2004), hypotheses testing design is based on the inferential analysis in order to establish what validity the data can denote some conclusions about the relationships between variables. Consequently, the researcher recognises the suitability of this kind of design for the present research.

3.3 Research Instrument

According to Hair, Black, Babin and Anderson (2013), there are four basic design techniques four causal types of research, namely survey, experiments, secondary data and observation. The survey has been acknowledged as the most common use of social science data collection technique. It is the data collection technique according to the

interaction with a representative sample of the individual (Zikmund *et al*., 2010). Forms of the survey are identified, such as phone interview, internet, and various types of questionnaires (Neuman, 2011). Surveys are the process of posing many questions at a time, and many variables are measured at once which give room to the gathering of expressive and examination of multiple hypotheses in one study (Neuman, 2011). This study employed a survey instrument based on measures used in past literature.

Snow and Thomas (1994) highlight that questionnaire survey can produce a great quantity of data that can be subjected to numerical analysis and give the respondents the utmost discretion to answer the questions. Additionally, a questionnaire survey technique has been said to be the most general and appropriate technique of producing primary data in the business study (Hair, Black, Babin, & Anderson, 2013). Therefore, a questionnaire survey is appropriate for this study. The survey instruments asked questions about the predictors of behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. In sum, this study using the self-administered questionnaire as the technique of primary data collection as it enables the researcher to collect data within a short period of time, and it also motivates respondents to provide their frank feedback (Zikmund *et al*., 2010). Moreover, a printed questionnaire also an effective and efficient data collection tool to measure the variables of the study (Sekaran & Bougie, 2013).

3.3.1 Questionnaire Design

A structured questionnaire was designed to measure the variables under study. A questionnaire was utilised to get the required information from respondents. The questionnaire was outlined, organised, and meant to get the required data. The questionnaire for the present study was intended to be imprinted in a booklet design.

As indicated by Sudman and Wansink (2004), developing a booklet format questionnaire maintains a strategic distance from pages from being lost or misplaces. Also, the booklet format makes it less demanding for the respondents to peruse and complete the survey as it makes it easier for the respondent to read and answer the questionnaire.

The questionnaire contains three sections. The first section consists of an introduction, the definition of e-wallet transaction via QR code, confidentiality statement and the appreciating subjects for contributing in the survey. The second section is about the demographic profile and last section measure about the opinion on the acceptance of e-wallet transaction via QR code. In the second section, three filter questions are asked to distinguish the mobile phone users, mobile phone internet-enabled users and e-wallet users. In the third section, the items of all the variables were measured based on Table 3.1.

3.3.2 Instrument Variables

The survey measures nine variables in this study, namely optimism, innovativeness, discomfort, insecurity, facilitating conditions, performance expectancy, effort expectancy, social influence and behavioural intention to use e-wallet transaction via QR code. All instrument variables were adapted from prior studies, and the survey items were modified to suit with the e-wallet transaction via QR code context. Table 3.1 provides a list of all questionnaire items.

Table 3. 1
Total Measurement Items for Constructs

Constructs	Status	Source	Items
Behavioural Intention to Use E-Wallet Transaction via QR Code	Adapted	Habbal, (2017)	**BI1** I think I would like to use e-wallet transaction via QR code. **BI2** I would feel good about using e-wallet transaction via QR code. **BI3** I think positively toward using e-wallet transaction via QR code. **BI4** I think I have the intention to use e-wallet transaction via QR code. **BI5** I predict that I would use e-wallet transaction via QR code. **BI6** I plan to use e-wallet transaction via QR code. **BI7** I guess I intend to be a heavy user of e-wallet transaction via QR code. **BI8** I think I have the intention to use e-wallet transaction via QR code in the near future. **BI9** I think I am willing to use e-wallet transaction via QR code. **BI10** I guess I will use e-wallet transaction via QR code in regular basic in the near future.
Performance Expectancy	Adapted	Faaeq *et al*., (2017)	**PE1** I believe that e-wallet transaction via QR code will be very useful in my life. **PE2** I think using e-wallet transaction via QR code will enable me to accomplish a transaction more quickly. **PE3** I think e-wallet transaction via QR code will enhance my life efficiency. **PE4** I think e-wallet transaction via QR code would enable me to access it anytime when I need it. **PE5** I think e-wallet transaction via QR code could enhance the level of convenience in accessing banking services.
Effort Expectancy	Adapted	Faaeq *et al*., (2017)	**EE1** I think it is easy for me to understand the e-wallet transaction via QR code. **EE2** I think it is easy for me to use e-wallet transaction via QR code. **EE3** I think it is easy for me to learn e-wallet transaction via QR code.

			EE4 I think it is easy for me to become skilful at using e-wallet transaction via QR code. **EE5** I think my interaction with e-wallet transaction via QR code would be easy for me.
Facilitating Conditions	Adapted	Faaeq, Rasheed, Al-ansi, Homaid, and Faieq, (2017)	**FC1** I think I have the necessary resources to use e-wallet transaction via QR code. **FC2** I feel that I have the necessary knowledge to use e-wallet transaction via QR code. **FC3** I think a specified information and support is available in case of difficulty to use e-wallet transaction via QR code. **FC4** I think using the e-wallet transaction via QR code will fit into my work style. **FC5** I believe that I have enough internet experience to use e-wallet transaction via QR code.
Social Influence	Adapted	Faaeq *et al*., (2017)	**SI1** I believe that people in my community will think that I should use e-wallet transaction via QR code. **SI2** I feel that people who are important to me will think that I should use e-wallet transaction via QR code. **SI3** I believe that my community will support me to use e-wallet transaction via QR code. **SI4** I feel that using e-wallet transaction via QR code will enhance my knowledge about the environment. **SI5** I feel that people who use e-wallet transaction via QR code have more prestige.
Optimism	Adapted	Rojas-Méndez, Parasuraman, and Papadopoulos, (2017)	**OP1** I think e-wallet transaction via QR code will give me more freedom of mobility. **OP2** I feel that e-wallet transaction via QR code is the newest technology that is much more convenient to use. **OP3** I think e-wallet transaction via QR code will be mentally stimulating. **OP4** I think e-wallet transaction via QR code will allow me to tailor things to fit my own needs.

			OP5 I think e-wallet transaction via QR code will make me more efficient in my profession.
Innovativeness	Adapted	Rojas-Méndez, Parasuraman, and Papadopoulos, (2017)	**IN1** I feel that I can figure out e-wallet transaction via QR code without help from others. **IN2** I feel that other people will come to me for advice on e-wallet transaction via QR code. **IN3** I feel that I will have fewer problems than other people in making e-wallet transaction via QR code work for me. **IN4** I feel that I can keep up with the e-wallet transaction via QR code in my area of interest. **IN5** I think I will be the first in my circle of friends to adopt e-wallet transaction via QR code.
Discomfort	Adapted	Rojas-Méndez, Parasuraman, and Papadopoulos, (2017)	**DI1** I think that e-wallet transaction via QR code is not designed for use by ordinary people. **DI2** I think it is embarrassing when I have trouble with e-wallet transaction via QR code while people are watching. **DI3** I feel that e-wallet transaction via QR code will seem to fail at the worst possible time. **DI4** I think that the instruction of e-wallet transaction via QR code is not easy to understand. **DI5** I feel that e-wallet transaction via QR code has risks that are not discovered until after people have used it.
Insecurity	Adapted	Rojas-Méndez, Parasuraman, and Papadopoulos, (2017)	**IY1** I feel that e-wallet transaction via QR code is not safe for me to provide my financial information over a mobile phone. **IY2** I think e-wallet transaction via QR code will lower the quality of relationships by reducing personal interaction. **IY3** I think e-wallet transaction via QR code is not safe for me to do any financial transaction online. **IY4** I do not feel confident in doing business with a place that can be reached online including e-wallet transaction via QR code. **IY5** I think e-wallet transaction via QR code is not safe for me to expose my financial information online.

Base on Table 3.1, a study in behavioural intention was adapted from Habbal, (2017). In this study, the researcher adapted the behavioural intention instrument due to its suitability to meet the study's research objectives. In this study, the context was adapted to e-wallet transaction via QR code. The construct was measured using the seven-point Likert scale. The scale ranges from "1=Strongly Disagree to 7= Strongly Agree". Table 3.1 explains in detail the instruments of behavioural intention.

Next, the measurement for facilitating conditions, effort expectancy, performance expectancy and social influence were adapted from Faaeq, Rasheed, Al-ansi, Homaid, and Faieq, (2017). The purpose of these instrument items was to obtain information regarding the underpinning theory of UTAUT. The measure applies a seven-point scale starting with (1) for "strongly disagree" to (7) for "strongly agree", in the context of e-wallet transaction via QR code.

Last, constructs from TRI, namely optimism, innovativeness, discomfort and insecurity were derived from the works of Rojas-Méndez, Parasuraman, and Papadopoulos (2017). The measurement items apply a seven-point scale starting with 1=Strongly Disagree to 7= Strongly Agree. The details of these items are shown in Table 3.1.

3.3.3 Instrument Scale

The items contained in the questionnaires were aimed at measuring the M40 millennials' behavioural intention to use e-wallet transaction via QR code in Malaysia. The measurement scale is very important in choosing the right statistical test. Variables can be measured and conveyed in different scales, but the most popular scale that applied to IT or IS research is the Likert scale (Sekaran & Bougie, 2010). The Likert-

type scale is preferred because it is considered to be the most appropriate, reliable and also easy to analyse statistically (Alreck & Settle, 2003; Jackson, 2012).

According to Sudha and Baboo (2011), the Likert scale is used to getting the opinion regarding a specific level of agreement to a measurement item in the questionnaire. The Likert scale is the sum of responses on several Likert items while the Likert items are the statements which the respondent is asked to assess based on subjective or impartial criteria (Burns & Bush, 2014). Likert scaling is a bipolar scaling technique and measures positive or negative response to a given statement neutral (Allen & Seaman, 2007). In this study, multi-items of the construct are measure using the seven-point Likert scale in order to specify the respondents' level of agreement to statements, where all the measurement scale items, with anchors ranging from (1) "strongly disagree" to (7) "strongly agree" with (3) "neither agree nor disagree" as the middle point.

There are different measurement scales in Likert, such as a five-point and a seven-point Likert scale that will be chosen according to the previous research. Despite some literature argued about the benefits inherent in five-point Likert Scale but still, a seven-point Likert Scale is said to produce detailed feedback and not subjecting the respondents of the survey into an undue cognitive burden (Cavana, Delahaye, & Sekaran, 2001; Hair, Black, Babin, & Anderson, 2010). The seven-point itemised rating scale is chosen on the notion that scale between five-point and seven-point have proven to be more reliable and that when measuring items with bipolar variables, the 7 point is most acceptable and gives room to the respondents to express their view clearly and allows the researcher to manifestly make precise distinction of individual's perception on particular element (Krosnick & Fabrigar, 2012).

The general opinion is that though having more scale points is better, lean towards declining after around eleven-points; thus it is always better to use seven-point which gives a good balance to have enough points for discriminating without having to retain too many response alternatives (Nunnally, 1970). Additionally, the influence of respondents' bias is reduced, and the quality of data increases with mid-point scaling; this also allows the respondents the freedom to express their feelings (Krosnick & Fabrigar, 2012). Also, psychological research indicates that respondents can perceive seven distinct reliability (Weisberg, Krosnick & Bowen, 1989), so a seven-point Likert scale is not too complex for capturing the agreement or disagreement. Ahire, Golhar, and Waller (1996) found that a seven-point scale captures more variations than a five-point scale. Likert scale was utilised because it is easy to construct, has intuitive appeal, adaptability and usually have better reliability (Babbie, 2015; Nunnally, 1970).

Thus, in order to achieve a better optimal result in scale reliability and information processing, a seven-point Likert scale is argued to be efficient (Churchill & Peter, 1984). In a Likert scale, respondents must choose amongst the given options. Consequently, the researcher is capable of seeking answers about the given statement through a set of response keys. A seven-point Likert scale was applied in this study for every measurement item in order to understand the perceptions regarding behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.

3.4 Population and Sampling

This section will discuss the target population, sampling size and sampling technique in order to satisfy the prerequisite of the study.

3.4.1 Target Population

Target population refer to proper sources of the population that represent the crucial characteristics from which data are collected (Zikmund *et al.*, 2010). It refers to the whole group of individual, things or events that the researcher desires to study (Sekaran & Bougie, 2013). The target population of this study are M40 millennials. There two main reasons of why they have been chosen as respondents in this study which will be discussed below.

In this study, M40 millennials are selected as target respondents because of two main reasons. First, the decline in personal income tax in M40 will transform into a rise in their disposable income, boosting the spending of M40 millennials. Base on to the estimation from government, these consumers will have an extra RM300 to RM1,000 per household, amounting cumulatively to around RM1.5billions in additional disposable income that will improve the GDP growth in Malaysia (Mottain, 2017).

In addition, the M40 of household income (commonly known as M40) is very important because it is the core spending of national consumer and private sector investment. The social values and values of the middle-class sociocultural system can determine the historical journey of the country (The Star Online, 2015). Birdsall (2010) reveals that the middle class is the main pillar of democracy, certifying social and political stability by promoting social cohesion and reducing tensions between the poor and the rich. They identified the middle classes as the segment, not poverty (Rodrigo, 2016), as rich would continue to spend money on acquiring luxury cars and high-end properties, while low-income groups are having problems coping with the higher cost of living (Kaur, 2018).

Second, millennials are considered as part of the M40 (The Media Insight Project, 2015). M40 millennials are an affinity with the digital world (PwC, 2012a). In Malaysia, 88 percent of millennials own a smartphone (Shen, 2017). They are the first generation that acts as the early adopters of technology and they never experience the world without IT (Akanbi, Sulaiman, & Adeyemi, 2018). They always act as the active users of mobile technology devices as they grow up with technology, and technology act as the second nature for them (Dumeresque, 2012; Holley, 2008). Additionally, almost all of them can master some skills of technology and apply the efficacy skills of technology in their daily activities (Cuong *et al*., 2015). For instance, based on the MCMC (2018) and Boston Consulting Group and AliResearch study, consumers ages 35 or younger are expected to be responsible for the majority consumption growth of technology (eMarketer, 2016).

Furthermore, millennials in the middle household income will lead them to be even more important as a consumer group. The adequate technological savvy and purchasing power of this consumer group will play an essential role in determining whether online organisations will be the long-term success (Valentine & Powers, 2013). Last, they are easily accessible. Therefore, due to the reasons, M40 millennials were recognised as the population for this study.

3.4.2 Sampling Size

The sample is a subset of the population, and the size must represent the population of the study (Sekaran & Bougie, 2010). In the procedure of identifying the minimum sample size needed for this study, a few suggestions from several research authors are taken into consideration.

First, Creswell (2012) demonstrated that the large sample would lead to a less probable error which the sample might vary from the population. Thus, greater sampling size is more accurate compared to smaller sampling size and simultaneously reduce the sampling error. Moreover, Hair, Black, Babin, and Anderson (2010) proposed that a sample of a minimum of 200 observations is a suitable sample size. However, Sekaran and Bougie (2013) argued that too large in sample size which is more than 500 are not appropriate to the research project.

Meanwhile, the total number of M40 millennials in Malaysian are more than 10,000,000 (Department of Statistics, 2019; Khazanah Research Institute, 2016). Thus, according to Krejcie and Morgan (1970), the minimum sampling size that more than 100,000 individuals are 384. Therefore, this study decides to employ the minimum sample size of 384 as refer to Table 3.2 below (Tabachnick & Fidell, 2013).

Table 3. 2
Total for Determining Sample Size for a Given Population

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Note. "N" is population size
"S" is sample size.

Source: Krejcie and Morgan, (1970)

3.4.3 Sampling Techniques

According to Sekaran and Bougie (2013), sampling refers to selecting the adequate number of right individuals from the population in order to estimate the parameter of the population. As Saunders *et al.* (2015) expressed that the sampling technique provides various techniques that allow the researcher to diminish the amount of data that researcher obliged to gather, and only need to consider data from sub-group rather than all possible scenarios. It means that the researcher will obtain the data from the sample in order to investigate the situation regarding the purpose of the study rather than collecting the data from the entire subject. Moreover, sampling also helps to reduce the time and cost of data collection process (Hair, Black, Babin, & Anderson, 2013).

This study employed a purposive sampling technique to determine the respondents. Purposive sampling "is confined to the specific type of people who can provide the desired information" (Sekaran & Bougie, 2010, p.276). This sampling technique is suitable because the target group of the study have specific characteristics in order to make sure the explanation of data is meaningful. The needed information is required to be obtained from the specific target group which is M40 millennials in order to provide the desired information (Sekaran & Bougie, 2013). This target group are selected according to the needs of the study, where respondents who do not meet the characteristics will be rejected for further analysis. As this study is examining the behavioural intention to use e-wallet transaction via QR code, five filter questions were asked to distinguish the age group, household income level, mobile phone users, mobile phone internet-enabled users and non- e-wallet transaction via QR code users. Thus, this sample is expected can serve the research purpose.

3.5 Data Collection

In this study, data was collected using survey methods. The reason for choosing this approach is that it provides access to a wider range of geographic data at a lower cost than interviews and telephony methods (Hochstim & Athanasopoulos, 1970). Respondents can easily and anonymously answer the questionnaire because the data can describe the exact and accurate method of reflecting the population (Bryman & Bell, 2011; Zikmund, Babin, Carr, & Griffin, 2010).

In the process of gathering data using this technique, this study employed structured questionnaires using the self-administered method. The distribution of structured questionnaires is distributed manually. The reason researchers chose this technology is based on their ability to have a high response rate. In the process of gathering data using this technique, this study employed structured questionnaires using the self-administered method. All of the structured questionnaires were distributed by hand. The reason for the researcher to choose this technique is because this technique have the ability to get the higher response rates (Parker, 1992; Schaefer & Dillman, 1998).

In order to ensure an increase in the response rate throughout the data collection procedure, some precautionary stages were undertaken. One such precaution, the questionnaire design in this study was ensured to be attractive and having a professional appearance to promote higher respondent participation in the survey (Couper, Traugott, & Lamias, 2001). Set of questionnaires was printed in the form of a booklet format, which made it simpler for respondents to read and answer the questionnaire.

3.6 Data Analysis Techniques

The data analysis focuses on testing and interpreting the of the determinants that affect the behaviour of intention to use the e-wallet transaction via QR code among M40 millennials in Malaysia. The present study relied on upon six critical steps to analyse the collected data which including preliminary analysis, preparation of the data for analysis, descriptive statistics, underlying statistical assumptions, evaluation of the measurement instrument, and testing of the developed hypotheses (Zikmund *et al*., 2010). Those analyses which ought to be taken in quantitative studies (Rajalahti & Kvalheim, 2011; Sekaran & Bougie, 2010). Moreover, this study investigates the quantitative data where the outcomes are from the collected questionnaires. Then, the data will be analysed by using Statistical Package for Social Sciences (SPSS) version 20.0 and SmartPLS 2 M3 software.

SPSS is an analysis software for information management and analysis software. It can use to conduct factor analysis, descriptive statistics, reliability analysis and other specialised analysis which cater for a research study (Wright, 1997). Moreover, the frequency table and descriptive table can also be analysed by using SPSS, while SmartPLS 2 M3 is using for partial least square structural equation modelling (PLS-SEM) analysis. Consequently, primary data acquired from the questionnaires will be investigated by utilising both SPSS and SmartPLS 2 M3 software in this study. Table 3.3 summarises the investigation steps, statistical analysis steps, techniques, and software employed in the present study.

Table 3. 3
Statistical Analysis Steps, Techniques and Software Employed in the Study

Analysis Step	Analysis Technique	Analysis Software
Response rate	Response rate	Not Available
Data Screening	Detecting Data Entry Error Missing Value Imputation Outliers treatment	SPSS v20
Preliminary Analysis	Normality Test Linearity Test Homoscedasticity Test Multicollinearity Test Measurement Sampling Adequacy (KMO-Barlett Test) Reliability Test Common Method Bias Test Non-Response Bias	SPSS v20
Descriptive Statistics	Frequencies Mean Variance Standard Deviation	SPSS v20
Assessment the Outer Model or Measurement Model	Internal Consistency Convergent Validity Discriminant Validity	SmartPLS 2 M3
Assessment of the Inner Model or Structural Model	Structural Model Specification Estimates for Path Coefficients Assessment of Effect Size (*f2*) Assessment of Predictive Relevance (Q-square statistics) Assessment of Goodness-of-Fit (GoF)	SmartPLS 2 M3
Mediation	Mediating Effect	SmartPLS 2 M3
Testing hypotheses	Structural Equation Modelling (SEM)	SmartPLS 2 M3

3.6.1 Mediating Effect Test

Mediation can be moulded while the mediating variable is involved between two other related constructs. More precisely, changes in exogenous construct lead to changes in mediator variables, which in turn lead to changes in the endogenous construct in the PLS path model (Hair *et al*., 2016). The following Figure 3.1 illustrates the general mediator model. In the PLS-SEM, the bootstrapping approach is suitable for mediation analysis because bootstrapping makes no assumption about statistical sampling distributions and can be applied to small sample sizes (Hair *et al*., 2013).

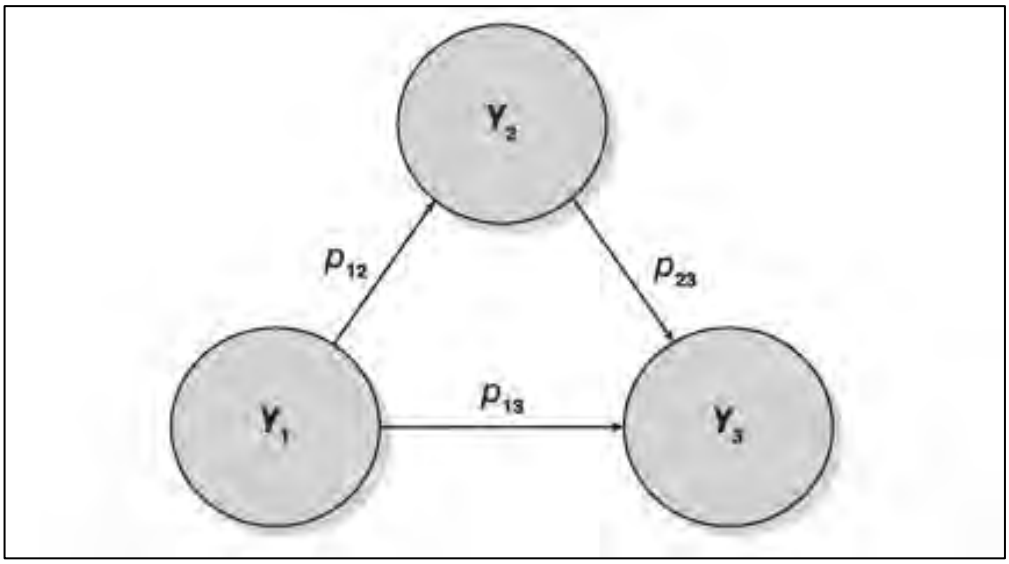


Figure 3. 1: General Mediator Model
Source*:* Hair, Sarstedt, Hopkins and Kuppelwieser (2014) *p. 220*

To carry out the mediation analysis in PLS-SEM, by referring to Preacher and Hayes (2008), there is two steps procedure which including to check the significance of direct effect and the significance of an indirect effect. In detail, the first step is to measure the direct effect of exogenous variables on endogenous variables, where it should be significant if the researcher does not include the mediating variable (Zhao, Lynch & Chen, 2010).

By referring to the Figure 3.1 and Figure 3.2, if the direct path (path p_{13}) is significant, next step is including mediating variable in the path model of PLS then evaluating the significance of indirect path (path p_{12}* p_{23}). The importance of each path (path p_{12} and path p_{13}) is requirement significant for this circumstance. The evaluation of indirect path is carried after running the procedure of bootstrapping, and if the indirect effect is found significant, then mediator absorbs some of the direct paths. Figure 3.2 below illustrates the mediator analysis procedure in PLS-SEM.

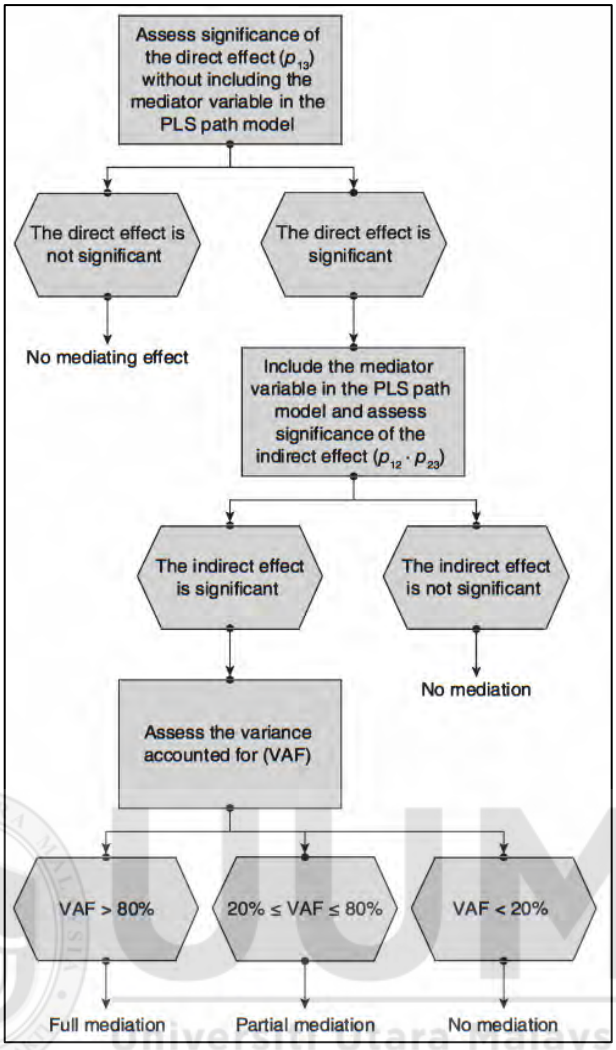


Figure 3. 2: Mediator Analysis Procedure in PLS-SEM
Source: Hair, Sarstedt, Hopkins and Kuppelwieser (2014) *p. 224*

To examine whether the mediator completely mediates the relationship between exogenous and endogenous variable, this study will assess how much of the direct path is absorbed by using variation accounted for (VAF), which is calculated as:

$$VAF = \frac{Path\ a\ \times\ Path\ b}{Path\ a\ \times\ Path\ b + Path\ c'}$$

Based on the value of VAF, if the value of VAF is less than 20 percent, then we can conclude that no mediation effect has taken place in this given relationship. In contrast, when the VAF has more than 80 percent outcome, then, a full mediation effect can be

assumed; while partial mediation effect takes place when the outcome of VAF is higher than 20 percent and less than 80 percent (Hair *et al.,* 2014).

3.6.2 Moderating Effect Test

Moderator is the variable which affects the direction and or strength of the relationship between an independent and dependent variable (Baron & Kenny, 1986). Moderator variable can be qualitative or categorical like gender, race, class, and many more, or quantitative such as level of reward. In this research, facilitating conditions and social influence are the two quantitative moderators. Moderating effects or interaction effects are taking place when it influences the strength of the direct effect between exogenous and endogenous variable (Henseler & Sarstedt, 2013). In PLS, the two approaches, product indicator and group comparison, can be utilised to estimate the interaction effects. The product indicator approach is appropriate for continuous variable such as the Likert scale (Chin, Marcolin, & Newsted, 2003). In this approach, the interaction term is derived by the multiplication of each item belonging to the endogenous variable, and each item belongs to moderating variable (Wilson, Petticrew, Calnan, & Nazareth, 2010).

The second approach, group comparison, is used where any of the endogenous or moderator variable does not characterize as a continuous variable. In this approach, for each group, the model with the direct effects is estimated individually, and the interaction effect is examined by separating the model moderating effect observed by examining the differences in the model parameters (Henseler & Sarstedt, 2013). Henseler and Sarstedt (2013) suggest that for the moderating effects the interaction path must be significant in order to support the moderator hypothesis and moderating effect strength should be assessed by comparing the R^2 of the main effect model. For

instance, model without moderating effect from R^2 of the full model and the model including the moderating effect that is also known as the effect size.

This study applied a product indicator approach using Partial Least Squares Structural Equation Modelling to detect and estimate the strength of the moderating effect of facilitating conditions and social influence on the relationships between optimism, innovativeness, discomfort and insecurity towards behavioural intention to use e-wallet by using QR code. The product term approach is considered appropriate in this study because the moderating variable is continuous (Rigdon, Schumacker, & Wothke, 1998). According to Jörg Henseler and Fassott (2010) "given that the results of the product term approach are usually equal or superior to those of the group comparison approach, we recommend always using the product term approach" (p. 721). To apply the product indicator approach in testing the moderating effects of facilitating conditions and social influence on the relationships between the indicators of the latent exogenous variables and the indicators of the latent moderator variable need to be created, hence, these product terms would be used as indicators of the interaction term in the structural model (Baron & Kenny, 1986).

3.7 Data Analysis Procedure

The data analysis stress on testing the relationships between exogenous and endogenous variables. The technique of data analysis is the procedure, and statistical tools employ by a researcher in order to analyse data, test research hypotheses and then refine theories. In this study, in order to analyse the data and hypothesis testing, several statistical techniques were used.

As the collected data was from a quantitative method, the first step is to make sure the data was filled, correct and applicable for further examination (Sekaran & Bougie, 2013). After raw data was obtained from the field, the whole usable questionnaires were coded and keyed-in to the SPSS. In SPSS, each row in the data file represents a case or observation for a single respondent, and each column represents a variable (a single survey item or a single personal demographic question) (Sekaran & Bougie, 2013).

After the end of the first stage, the next procedures, including data screening and preliminary analysis to check for any abnormalities. Regarding data screening and cleaning, the purpose of data screening is to make sure the data is clean of ambiguous data and errors. Ambiguous data can have an effect or negative influence on the outcomes. Moreover, data screening and preliminary analysis which including a test of linearity, normality, homoscedasticity test, measurement sampling adequacy test, multicollinearity testing, common method bias test and non-response bias will also be tested in this study.

Before the inferential analyses were conducted, the analysis of survey responses with response rates and respondents' profile will be performed. Then the data were analysed using descriptive statistics. This is to summarise the data and to analyse and understand them carefully. Those collected data then further analyses by using the Partial Least Squares Structural Equation Modelling (PLS-SEM) analysis in order to investigate the overall proposed model and hypothesis testing. The tests conducted through PLS including a test of the measurement model and structural model. The researcher utilised the SPSS 20 as a statistical tool to analyse the collected data, and those data are then further analysed by using the SmartPLS 2.0 to test the hypothesis.

In detail, exploratory factor analysis is about the validity and reliability quality of an instrument intended to measure a variable. With a specific end goal to guarantee the adequacy and consistency of the scales measuring each of the variables analysed in this study, factor analysis and reliability test were performed. To start with, factor analysis was completed on each of the variables to assure that the items intended to quantify them were sufficient. Table 3.4 demonstrates the criteria used to evaluate the factor analysis results.

Table 3. 4
Criteria for Assessing Factor Analysis Results

Factors	Standards
Skewness	< ±1
Kurtosis	< ±2
Kaiser-Meyer-Olkin (KMO)	> .50
Barlett's Test of Sphericity	< .05
Measures of Sampling Adequacy	> .50
Eigenvalues	> 1.00
Total Variance Explained	> .60 (60%)
Factor loading	> ±.50
Communalities	> .50

Source: Hair *et al*. (2010)

After the data assessments by using SPSS, SmartPLS 2 M3 are used to test the measurement model, structural model, mediating effect, moderating and hypothesis testing of this study.

3.8 The Rationale behind Choosing PLS-SEM

Structural Equation Modelling (SEM) is one of the utmost powerful statistical tools that can test several relationships simultaneously (Hair *et al*., 2013). Even though covariance-based approach (CB-SEM) such as AMOS has been a focused by previous researches (Hair *et al*., 2013), however, a variance-based approach or PLS-SEM with distinctive methodological attributes making it a possible alternative to the popular CB-SEM approach (Henseler, Ringle, & Sinkovics, 2009). PLS-SEM is the same as

the techniques of multiple regression analysis (Marcoulides, Chin, & Saunders, 2009). The main purpose is to maximize the variance explained in the endogenous constructs and to also measure the data quality on the basis of measurement of model characteristics.

The PLS technique was chosen for analysis in this study on account of several justifications. First, based on the recommendations from Hair, Ringle and Sarstedt (2011), and Hair *et al*. (2016), certain rules must be obeyed by the researcher before choosing the PLS-SEM as the analysis technique. The first rule is associated with research objectives. If the research objectives aim to focus on the importance of construct prediction or examine key drivers, the PLS-SEM is appropriate. In the present study, the researcher attempts to predict the influence of exogenous variables on endogenous variables. In this context, the exogenous variable is expected to be the "driver" to an endogenous variable. Therefore, the technique of PLS-SEM is a suitable method for data analysis in this study.

Another rule that fulfils with PLS-SEM technique is to relate to the model complexity. PLS is an appropriate statistical analysis tool for complex models (Fernandes, 2012; Hair, Sarstedt, Ringle, & Mena, 2012; Vinzi, Chin, Henseler, & Wang, 2010). The complexity of a model will also influence the method of data analysis (Hair *et al*., 2011). Because of the characteristic of SEM and the restrictions of AMOS, it was not possible to examine the entire model. However, PLS-SEM technique can use to estimate complex models with many indicators and model relationships (Hair *et al*., 2016). Large model with 50 or more measurement items is considered as a complex model (Chin, 2010; Shahriar & Hani, 2011). In this study, the structural model is undoubtedly considered as complex as the model had 50 measurement items.

Therefore, the PLS-SEM technique is a suitable approach to test the hypotheses of the study as PLS is a method of constructing a predictive model when there are many factors or measurement items involved.

The third rule that needs to obey before select the PLS-SEM technique is to examine the measurement model specification. PLS-SEM able to handle reflective and formative measurement models easily, as well as single-item constructs, with no identification problems (Hair *et al*., 2016). Theoretically, the variables involved in the study are reflective indicators, making the study appropriate for the PLS-SEM technique. Moreover, PLS is also useful when the key objectives of using structural modelling are to predict and describe a construct. When employing PLS-SEM, it is a benefit that the study can get high efficiency in parameter estimation. This is because it demonstrated in the technique's superior statistical power compare to CB-SEM. Greater statistical power refers to the PLS-SEM is more likely to provide a specific relationship significant when it is, in fact, significant in the population (Hair *et al*., 2016). Thus, PLS-SEM is more appropriate to test the study's hypotheses than CB-SEM as it is a flexible and good technique to build a statistical model and make a prediction (Ringle, Wende, & Will, 2010).

Next, the statistical properties of PLS-SEM will give a very strong model estimation with data that have either normal or non-normal distributional properties. However, the influential outliers and collinearity will affect the OLS regressions in PLS-SEM, and there is a must to evaluate the data and results for these issues (Hair *et al*., 2016). Besides, PLS-SEM relatively offers more clear and valid results, while other methods often lead to less clear conclusions and would require the researcher to undergo several separate analyses (Bollen, 1989).

Furthermore, SEM has been proved to be advanced models that perform estimations better than regressions for measuring mediation and moderation (Preacher, Rucker, & Hayes, 2007). According to Hair *et al*. (2016), PLS-SEM can provide more advanced analyses outcomes for mediating analysis. It has been documented that PLS-SEM accounts for measurement error and gives a more precise estimation of mediating effects (Chin, 1988). Thus, PLS-SEM is appropriate for this study.

In sum, as PLS-SEM can examine the measurement model and structural model simultaneously, and this will give a further complete investigation for the inter-relationships among the variable. Therefore, the PLS-SEM and two-step analysis approach are applied to analyse the data. As the current study examined relationships among nine variables, namely optimism, innovativeness, discomfort, insecurity, facilitating conditions, performance expectancy, effort expectancy, social influence, and behavioural intention to use e-wallet transaction via QR code within the structural model and thus, using PLS-SEM techniques was considered appropriate for better prediction for the research model.

3.9 Pilot-Test Study

The pilot study is a primary assessment to evaluate the goodness of measure by using the reliability test before distributing the final questionnaire (Sekaran & Bougie, 2010; Zikmund *et al*., 2010). The researcher has been conducted a pilot study in order to investigate the reliability of the research instrument. In addition, there are several advantages that could get from conducting a pilot study. First, it will help in developing and examine the adequacy of research instruments. Moreover, it also helps to detect the logistical difficulties that may happen during the process of data collection. Third, it also uses to measure the variability of the results in order to judge the sample size.

Fourth, the pilot test will determine whether the sampling frame and technique are convincing or not. Last, it helps to obtain the preliminary data (Teijlingen, Rennie, Hundley, & Graham, 2001).

Generally, a reasonable size for a pilot test is around 30 respondents (Malhotra, Hall, Shaw, & Oppenheim, 2008; Sekaran & Bougie, 2010), while Cooper and Schindler (2014) expressed that it might extend from 25 to 100 respondents. Thus, in this study, the total amount of 50 questionnaires will be distributed in Penang state by hand in order to collect the pilot test data. The pilot test was conducted on September 2018. Based on the collected data from the pilot study, the reliability of the instrument was tested where the Cronbach's Alpha value can be considered as excellent if it is more than 0.90, good if it is around 0.80, acceptable if it is around 0.70, and questionable if it is around 0.60, but unacceptable and poor if it is less than 0.60 (Zikmund *et al*., 2010). Table 3.5 shows the outcomes of the pilot test.

Table 3. 5
Pilot Test

Construct	No. of Items	Pilot Study Cronbach's Alpha Values
Optimism	5	0.8677
Innovativeness	5	0.9469
Discomfort	5	0.9095
Insecurity	5	0.9588
Performance Expectancy	5	0.8790
Effort Expectancy	5	0.8715
Facilitating Conditions	5	0.9395
Social Influence	5	0.8649
Behavioural Intention	10	0.9037

From the total of 50 distributed questionnaires, there is a total of 39 respondents have returned the pilot test questionnaire, which contributed to 78 percent of response rate in the pilot test. Table 3.5 presents the findings of a reliability test for all constructs.

The findings of the pilot test result indicate that the value of Cronbach's alpha for the respective constructs are in the range of 0.8649 to 0.9588. Base on Zikmund *et al*. (2013), all items used in the instrument are acceptable. Thus, it can be concluded that every construct is reliable, and none of the items needs to be removed.

3.10 Chapter Summary

In this chapter, the methodology of the study has been discussed critically. This chapter discusses and details out the research design and method, which is based on the quantitative technique by using an adapted questionnaire. Furthermore, this chapter also presents the variable measurement, target population, size of the sample, sampling techniques, data collection method and data analysis procedure. The method of SEM-based on PLS will be used to analyse data in this study. In the next chapter, research findings of the study were discussed and interpreted.

CHAPTER FOUR

RESULTS AND DATA ANALYSIS

4.1 Introduction

This chapter presents the findings of the study obtained from the quantitative analysis. The collected data will be analysed by using the application of Statistical Package for Social Sciences (SPSS) and SmartPLS version 2.0. This chapter initially presents the main results of the survey response and the preliminary analysis of data screening. The analysis of response rate, data screening that includes missing data and outlier, testing of response and non-responses bias, descriptive analysis, internal consistency, a test of normality, linearity, homoscedasticity sampling adequacy and multicollinearity will be presented in this chapter. Moreover, the analysis of the structural model and measurement model will be present together with the analysis of mediating and moderating constructs. Last, this chapter presents the findings of the formulated hypotheses of the study.

4.2 Response Rate

For the purpose of data collection, a total of 1,400 sets of questionnaires had distributed. Out of 1,400 questionnaires, a total of 866 were returned. Out of 866 returned questionnaires, 282 questionnaires were excluded because they are the user of an e-wallet as this study would like to focus only on the non-users of e-wallet.

Moreover, if the missing data is exceeded than 50 percent, it is advisable to remove the case respondent (Hair *et al*., 2010). By following the suggestion from Hair *et al*. (2010), there are 97 questionnaires have discarded for more than 50 percent incompletion. Thus, out of 866 questionnaires, 379 questionnaires were rejected for further analysis because they were incomplete and excessive missing data and the user of e-wallet. This making the final number of usable questionnaires 487 and yielding a valid response rate of 34.79 percent. According to Sekaran and Bougie (2013), the recommended response rate of 30 percent for the survey are fitted for analysis. Thus, the gathered questionnaires are adequate for conducting further analysis in this study.

4.3 Demographic Profile

The demographic profile of the participants fundamentally shows the general background of respondents. Table 4.1 presents the demographic characteristic of the respondents in this study. Eleven demographic characteristics were identified in this study.

Table 4. 1
Demographic Characteristics of the Respondents

Demographic Variable	Category	Frequency	Percent (%)
Gender	Male	286	58.7
	Female	201	41.3
Age Group (years old)	22-37	487	100
Household Income Level	RM 4,360 – RM 9,619	487	100
Region	North Region (Kedah, Perlis, Pulau Pinang, Perak)	157	32.2
	Central Region (Kuala Lumpur, Selangor)	46	9.4
	South Region (Negeri Sembilan, Melaka, Johor)	96	19.7
	East Coast Region (Pahang, Kelantan, Terengganu)	99	20.3
	East Malaysia (Sabah, Sarawak)	89	18.3

Education Level	Diploma	108	22.2
	Bachelor's Degree	297	61
	Master's Degree	49	10.1
	PhD	18	3.7
	Others	15	3.1
Do you have mobile phone?	Yes	487	100
Number of Mobile Phone Owned	One	158	32.4
	More than one	329	67.6
Years of Mobile Phone Usage	Less than 1 year	21	4.3
	1 - 5 years	39	8
	6 - 10 years	109	22.4
	More than 10 years	318	65.3
Is your mobile phone Internet-enabled?	Yes	487	100
Years of Internet Experience	1 - 5 years	13	2.7
	6 - 10 years	107	22
	More than 10 years	367	75.4
Do you use any of the e-wallet program/ application?	Never use before	487	100

Table 4.1 shows that most participants are male (58.7 percent) while the remaining participants are female (41.3 percent). As for the age group and household income level, all respondents were in the age of between 22 and 37 years old, and in the household income level of RM4,360 to RM9,619. On the other side, there are total of 32.2 percent were coming from North Region (Kedah, Perlis, Pulau Pinang, Perak), 9.4 percent from Central Region (Kuala Lumpur, Selangor), 19.7 percent from South Region (Negeri Sembilan, Melaka, Johor), 20.3 percent from East Coast Region (Pahang, Kelantan, Terengganu), and 18.3 percent from East Malaysia (Sabah, Sarawak). In terms of the level of education, most of the participants held a bachelor's

degree (61 percent), 22.2 percent had a diploma, 10.1 percent had a master's degree, 3.7 percent had a PhD and 3.1 percent for others.

All of them have their own mobile phone, and 67.6 percent have more than one mobile phone compare to 32.4 percent only have one mobile phone. In relation to years of mobile phone usage, most of the participants had more than 10 years' experience (65.3 percent), 22.4 percent had 6 to 10 years, 8 percent had 1 to 5 years, and remaining 4.3 percent had less than 1-year mobile phone usage experience. All of their mobile phones are internet enabled, and the majority of them having more than 10 years of internet experience which contributed of 75.4 percent, followed by 22 percent of 6 to 10 years' experience, and 2.7 percent of 1 to 5 years of internet experience. Last, all of them do not use any e-wallet program or application yet.

4.4 Data Screening and Treatment

After collection of data, those data are coded, entered, edited and viewed into SPSS v20 in the data file. Data screening and cleaning is to ensure that the data is clean from ambiguous and errors (Sekaran & Bougie, 2010). This is essential in early steps in data preparing to obtain the best result. The step including in check on missing data, verifying the existence of any outliers, inspect the normality status, linearity, homoscedasticity, sampling adequacy, and last follow by multicollinearity before the multivariate analysis (Pallant, 2002). The following steps were taken for data screening.

Preceding initial data screening, all the 487 useable questionnaires received were coded and entered into SPSS v20. After the raw data had been entered in the SPSS v20, the next line of action done by the researcher was data screening and treatment. This

analysis involves examining the errors in the collected data (Byrne, 2013; Pallant, 2003). These errors take the form of missing data or out of range data (beyond the range of possible range of scale values). It was therefore important for the researcher to check on these and handle them accordingly (Appendix E1).

4.4.1 Detection of Missing Data

Questionnaires items that were not answered in the questionnaire survey is called missing data. Missing data refers to the invalid data in which respondents refuse to answer a question in the survey or may not know the answer due to lack of knowledge of the subject (Hair, Black, Babin, & Anderson, 2013). The issue of missing data is a famous issue in surveys processes (Hair *et al*., 2010). Thus, the first step in data screening is to identify the missing data in the given survey.

Missing data can be handled in many different ways. For instance, the way to handle missing data is to delete the individual case if more than 5 percent of the data is missing. Also, it can handle by replacing missing data with a known value (Hair *et al*., 2013). According to Pirker (2009), it is recommended that missing values be handled with imputation by replacing missing values using the remaining values of the data. To obtain accurate model specifications, the mean can be used for the imputation (Lemieux & McAlister, 2005; Sekaran & Bougie, 2013). Using the mean to replace missing values also leads to more reliable results than case-wise deletion (Parwoll & Wagner, 2012). This is because for pre-processed data that is intended to be exported to the PLS path modelling software, the case-wise deletion will throw away a lot of useful information, which will, in turn, lead to lower efficiency, and thus is not recommended (Temme, Kreis, & Hildebrandt, 2006). Thus, in this study, the missing data will be replaced with the variable mean (mean substitution) as the advantages of

this method are easy to apply, and it will provide complete information for all cases. Additionally, it is best used when it has pretty low levels of missing data and having pretty strong relationships among variables (Hair *et al*., 2013, 2016).

In this study, 487 returned questionnaires had small numbers of missing values. Therefore, based on the suggestions as stated above, since each item of the questionnaire has less than 5 percent of missing value, hence, the missing value should be replaced with the mean (Hair, Ringle, & Sarstedt, 2013). There is a total of 13 missing values. Thus, based on the missing value analysis, it indicated that none of the indicators had more than 5 percent of missing values which only ranges from 0.2 percent to 0.4 percent. The missing values were treated using SPSS by replacing them with a mean substitution (Rajalahti & Kvalheim, 2011). Thus, the 13 missing values are replaced by the mean of the nearby values, which leads to an improvement in correlation (Appendix E2).

4.4.2 Assessment and Treatment of Outliers

Outliers occur due to extreme responses. Detecting outliers will be conducted followed by the missing data step. Outliers are cases that score extreme or derivate observations (farthest scores from the average of the data set); therefore, have a great deal of influence on the results of any statistical analysis. In detail, outliers are the opposite value in construct to the overall data, which could influence the normality level of data. Any numerical value of an item either too large or small that different from other value of items should be considered as outliers (Byrne, 2013).

Similarly, the outliers will bias the mean and inflate standard deviation. Therefore, screening data is a significant process to detect them. By look at *z*-scores is one of the

methods to detect outliers (Field, Miles, & Field, 2009). To look for outliers, *z*-scores can be used and count how many falls within certain important limits. As stated by Keller (2014), the outliers are an unusually small or large observed value. The outliers help the researchers detect coding errors. The variance and covariance among the observed variables may be distorted while executing structural equation modelling (SEM) if there is a presence of the outliers.

As stated above, outliers occur due to the extreme responses, for example, when the questions were responded to either "strongly disagree" or "strongly agree". Outliers are the opposite values in contrast to the overall data values that could affect the normality level of the data. In this study, the researcher will concentrate on examining all metric variables to identify the outliers where their existences will affect the model firmness. To detect outliers, standardised values (z-scores) was applied for a univariate outlier's measurement in this study. As a univariate outlier is a data point that involves an extreme value on one variable, thus, this study used to test the outliers of each variable based on the data of total sample size, where the big sample with larger than 80 requires of z-score data that outside the range of ± 4.0 (Hair *et al*., 2013).

Since this study deal with 487 usable questionnaires, a value up to 4.0 is used as z-score to detect outliers in the collected data. By this method, a few samples which was identified as influential outliers were neutralised to increase the fitness of the entire data. The following Table 4.2, Appendix F1 and Appendix F2 were structured and shows that the z-score value for each variable is in between ±4.0.

Table 4. 2
Z-score of Constructs

Construct	Minimum	Maximum
Zscore: Optimism	-3.24550	1.60334
Zscore: Innovativeness	-3.03073	1.55159
Zscore: Discomfort	-2.75211	2.92614
Zscore: Insecurity	-2.52154	2.13846
Zscore: Facilitating Conditions	-3.22229	1.81796
Zscore: Effort Expectancy	-2.90440	1.89476
Zscore: Performance Expectancy	-3.72563	1.62594
Zscore: Social Influence	-3.05758	1.76509
Zscore: Behavioural Intention	-3.84355	1.76509

From Table 4.2 and Appendix F2, Z-score for all constructs are in between ±4.0, and z-score of measurement items in Appendix F1 are also in between ±4.0, meaning that there is no outlier in every single construct in this study.

4.5 Preliminary Analysis

Preliminary analysis is an inherent part of data analysis (Lees & Cooper, 1963). Preliminary analysis should be conducted before the preparation of the data for the assessment of measurement and structural models. Thus, assessment of normality, linearity, homoscedasticity, multicollinearity, measurement sampling adequacy, common methods bias and non-response bias will be tested in this section.

4.5.1 Assessment of Normality

After the assessment of outliers, there is an evaluation of the normal distribution of the data. The normal distribution is an important assumption of statistical analysis and structural equation models (Rajalahti & Kvalheim, 2011). PLS-SEM is a broad model that does not make assumptions about the normality of distribution of the data (Hair *et al*., 2013; Reinartz, Haenlein, & Henseler, 2009; Temme, Kreis, & Hildebrandt, 2010). Even though PLS-SEM is a non-parametric statistical method and does not require a

normal distribution of data, it is vital to evaluate whether if the data is not too far from being normal (Hair *et al*., 2013). This is due to extreme non-normal data may be a problem in evaluating the parameters. Furthermore, there is also inflation of standard errors from bootstrapping.

Normality determines the level of the distributed sample data tally to a normal distribution, and it also denotes when the data is normally distributed for the observed variable. When the data is a bell-shaped, it is considered to be normality distributed by examining the data plot histograms and the values of Kurtosis and Skewness (Hair *et al*., 2013). As the normality is used to show the symmetry curves of extremes frequency versus polarisation for medium and smaller frequencies (Pallant, 2013). There are researchers such as Kline (2015), and Pallant (2013) recommended assessing their skewness and kurtosis values in order to measure the normality of the score distribution for the dependent and independent constructs. Skewness and Kurtosis are the main tests that can be used to validate normality assumptions (Pallant, 2007).

Skewness and Kurtosis are the scores of distributions for variables. For more detail, the skewness uses to identify the distribution's balance; if it is unbalanced, the data curve is shift right (negative) or left (positive) whereas Kurtosis refers to the "peakedness" or "flatness" of the curve. In order to ensure that the data is normally distributed, the value of Skewness must be in the range between +1 and -1 (Hair *et al*., 2013). Any value that is range outside this range will not be considered as normal. Meanwhile, the Kurtosis value that ranges between -2 to +2 is considered to be normal (Bachman, 2004).

Table 4. 3
Normality Measurement of Variables

Construct	Skewness	Kurtosis
OP	-.879	.366
IN	-.997	.754
DI	.483	.815
IY	-.103	-.477
PE	-.922	.994
EE	-.427	-.193
FC	-.643	.040
SI	-.581	-.159
BI	-.910	1.098

Note: Where the 'OP' abbreviation refers to optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'FC' abbreviation refers to facilitating conditions. EE = effort expectancy, PE = performance expectancy, SI = social influence, and BI = behavioural intention.

Therefore, as shown in Table 4.3, the dataset indicates that there is no non-normality in this study (for more details, see Appendix G). The result indicated that the data set did not violate the normality assumption, indicating that all variables were approximately normally distributed.

4.5.2 Assessment of Linearity

Linearity is testing the relationships between the exogenous variable and the endogenous variable, which forecast the correct direction of the hypothesis. If linearity exists, it is represented by a linear line or a straight line which are directly proportional between exogenous and endogenous variables, which can predict the hypotheses' right direction; thus positive value represents the positive relationship and vice versa (Hair *et al*., 2013).

As per the recommendations of Hair *et al.* (2010), when there are multiple exogenous variables to ensure the best representation of the equation, the partial regression plot is utilised for each variable. To test this, the normal P-P plot of regression standardised residual plot was imposed for exogenous variables on the endogenous variable. The following Figure 4.1 to Figure 4.6 and Appendix H shows that the data in this study is

assumed to linear, and there is no quadratic data trend. Thus, the present study showed no issue in terms of linearity.

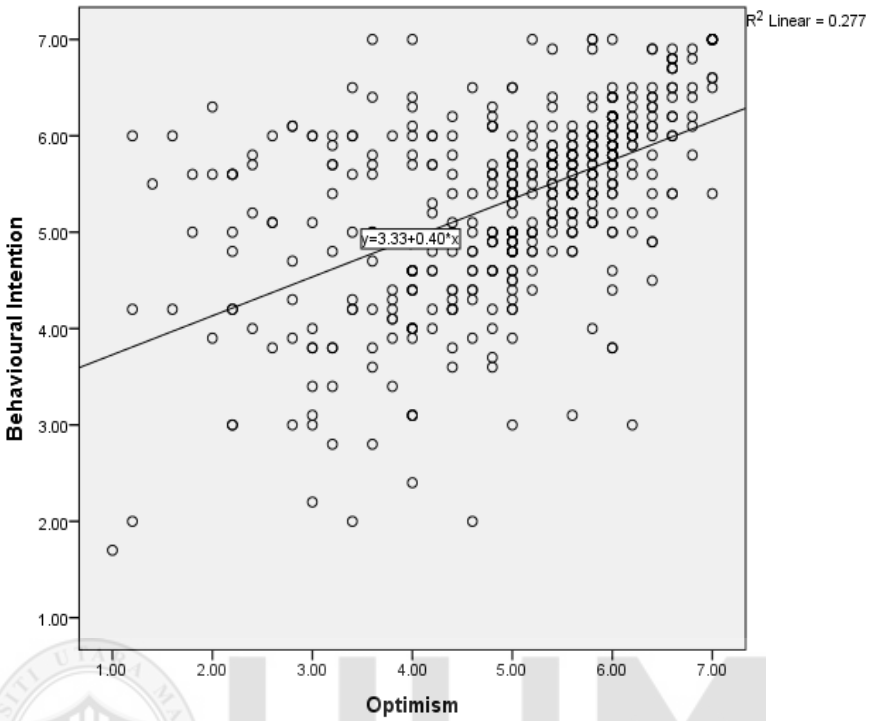


Figure 4. 1: Scatter-Plot of Optimism and Behavioural Intention

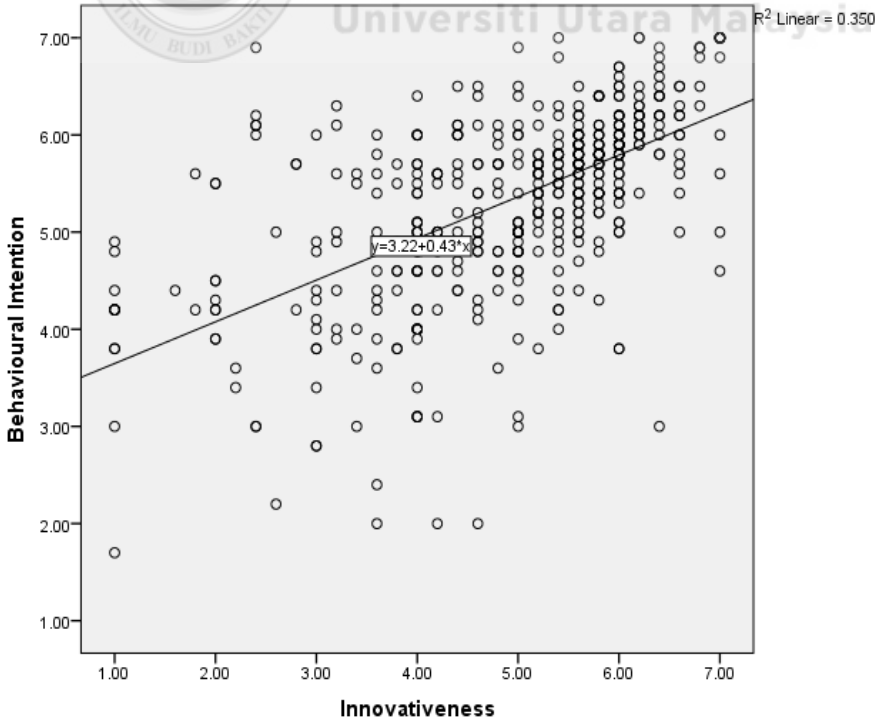


Figure 4. 2: Scatter-Plot of Innovativeness and Behavioural Intention

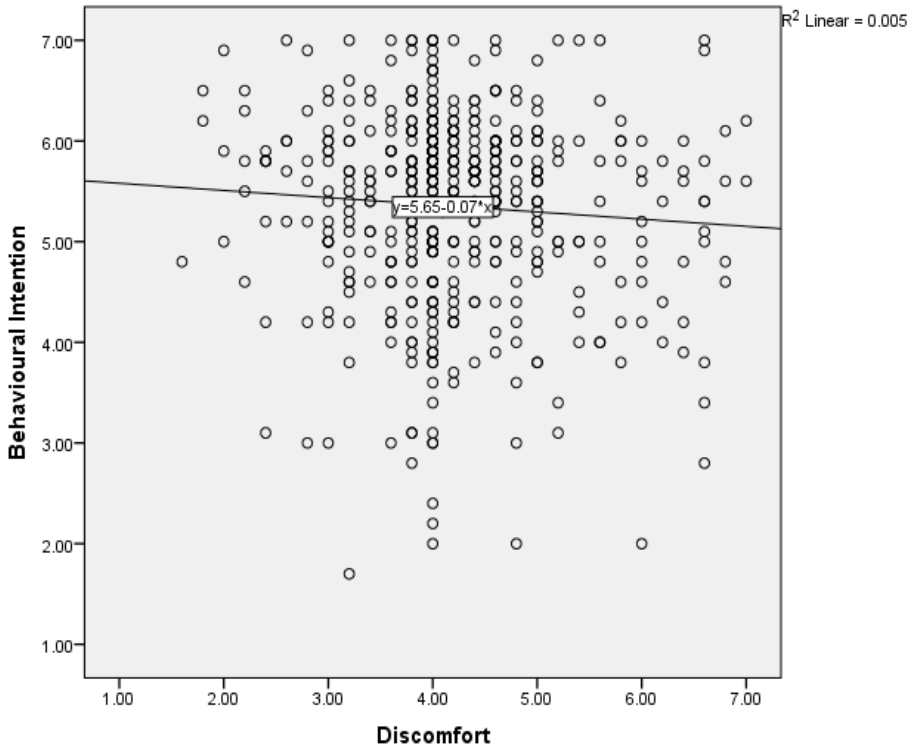


Figure 4. 3: Scatter-Plot of Discomfort and Behavioural Intention

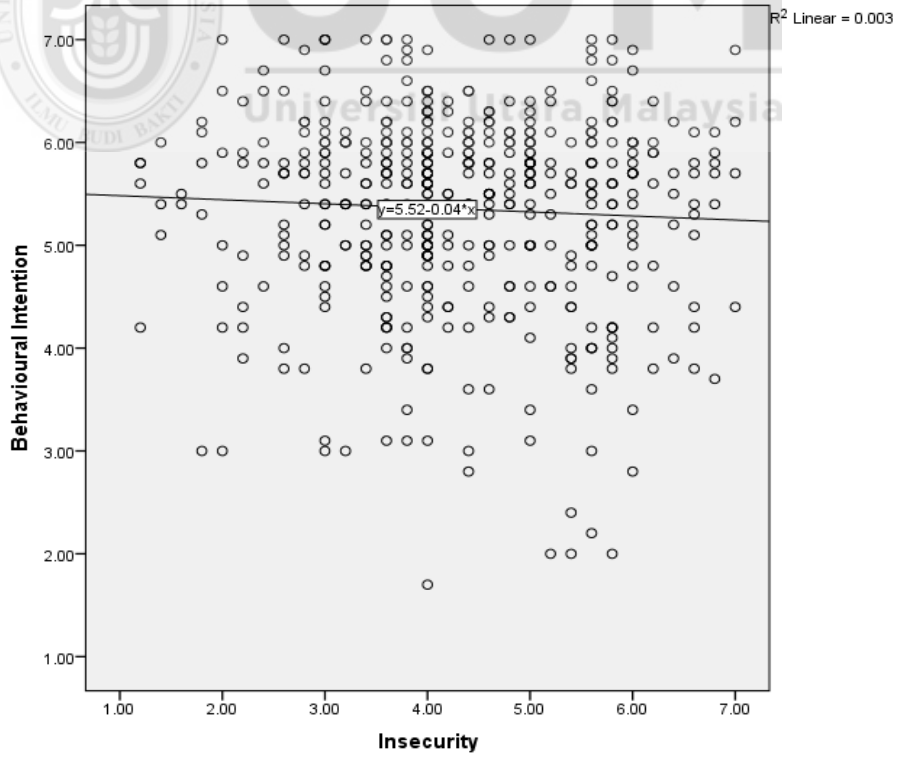


Figure 4. 4: Scatter-Plot of Insecurity and Behavioural Intention

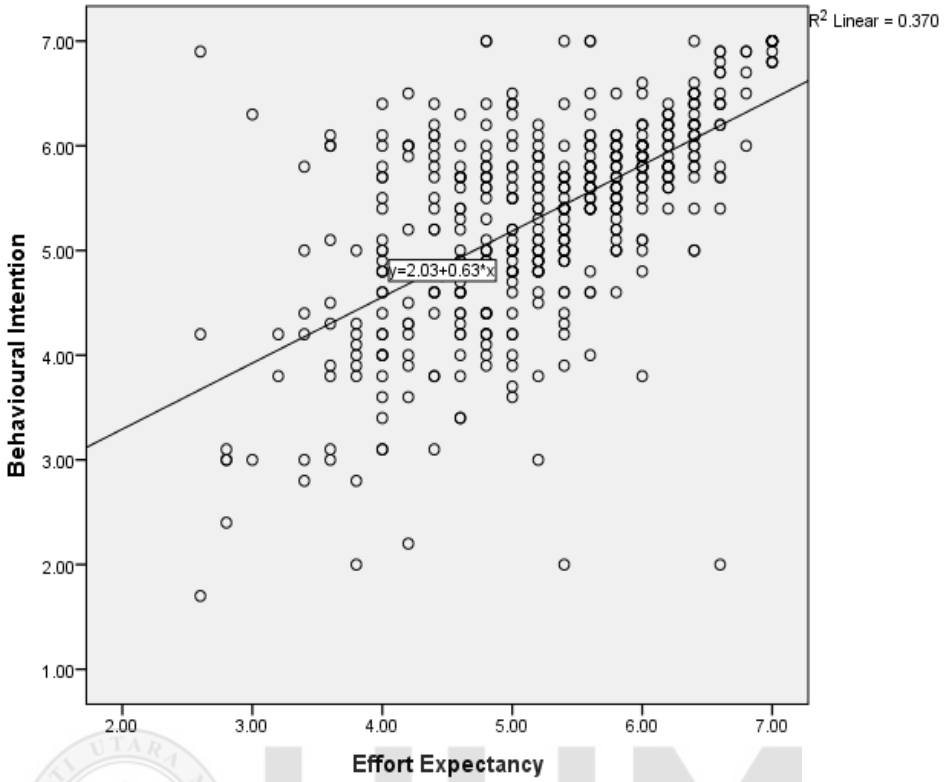


Figure 4. 5: Scatter-Plot of Effort Expectancy and Behavioural Intention

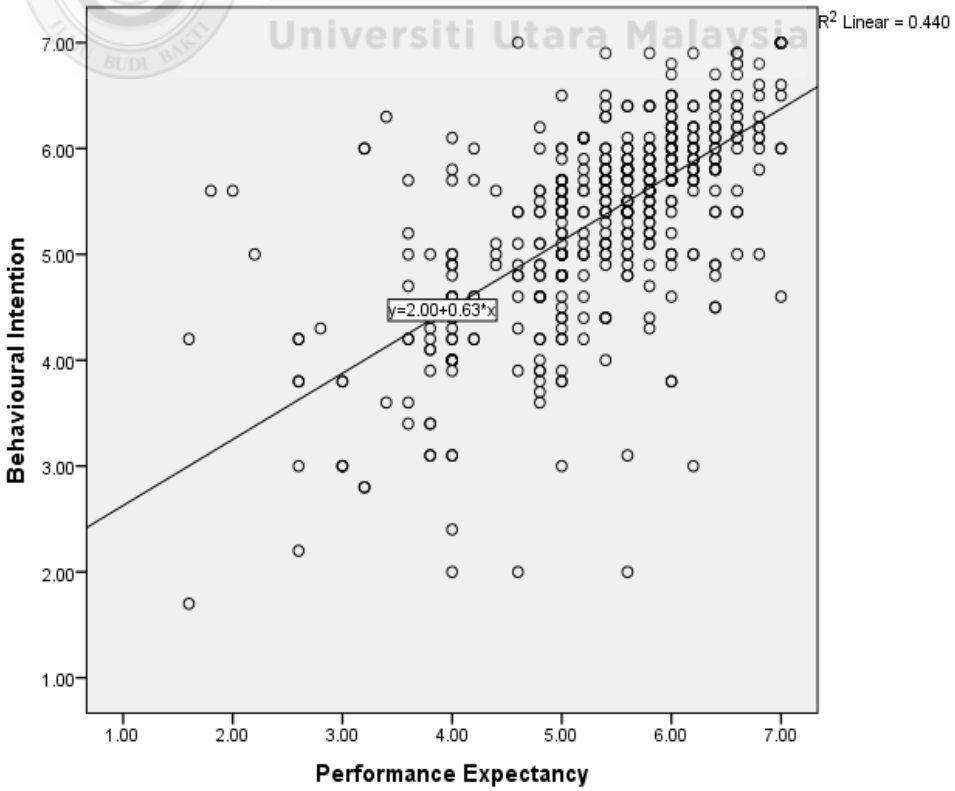


Figure 4. 6: Scatter-Plot of Performance Expectancy and Behavioural Intention

4.5.3 Testing of Homoscedasticity

Homoscedasticity assumption is one of the important steps that is needed to be tested before carrying out further parametric assessments. If the assumption is not meet, then the data is considering as heteroscedasticity, which indicates that the data is non-normally distributed, and the variances are heterogeneous.

This assumption is tested by using Levene's test, which offers a statistical assessment of whether the means of several groups are equal or not, and thus generalizes the t-test to two groups. Levene's test is useful for testing and comparing three or more means for the significance of statistic. Warner (2012) suggests that the probability value must be larger than 0.05 in order to fulfil the assumption of homoscedacisticity and to enable the regression model to go for further analysis. The following Table 4.4 shows the outcomes of the influence of respondents' gender on each variable.

Table 4. 4
Test of Homogeneity of Variance for the main Variables

Variable	Variance Homogeneity	Levene Statistic	Sig.
Optimism	Based on Mean	.067	.795
	Based on Median	.335	.563
Innovativeness	Based on Mean	.968	.326
	Based on Median	.159	.690
Discomfort	Based on Mean	.792	.374
	Based on Median	1.480	.224
Insecurity	Based on Mean	2.195	.139
	Based on Median	2.297	.130
Facilitating Conditions	Based on Mean	.009	.923
	Based on Median	.063	.802
Effort Expectancy	Based on Mean	.222	.638
	Based on Median	.052	.820
Performance Expectancy	Based on Mean	.871	.351
	Based on Median	1.381	.240
Social Influence	Based on Mean	.003	.954
	Based on Median	.075	.785
Behavioural Intention	Based on Mean	2.177	.141
	Based on Median	3.026	.083

The test results show that all individual constructs are not significantly different at the level $p > 0.05$ level; these are confirmation that all individual constructs meet the homoscedasticity assumption. Based on the results, the significance values of all variables are not significant, as shown in Table 4.4, meaning that the equality of variance is assumed. It also shows that the homogeneity of variables variance, and there are non-variance differences between the test factors (Hair *et al*., 2010).

4.5.4 Assessment of Multicollinearity

Multicollinearity is an extent to which variable can be described by the other variable. In other words, multicollinearity refers to the predictors that are strongly correlated among themselves or not (Hair *et al*., 2013; Tabachnick & Fidell, 2013). According to Field (2016), multicollinearity existence between predictors will make it difficult to evaluate the individual significance (importance) of a predictor. Thus, when two or more variables are highly correlated, this means that those variables contain unnecessary information. There is no necessity in the same analysis due to these may increase the term of error.

Field (2016) recommended diagnosing multicollinearity by looking at the variance inflation factor (VIF) and the tolerance values. Hair *et al*. (2013) suggest that below 10 for VIF, and over 0.10 for tolerance are acceptable values. Thus, the present study initially conducts the test of multicollinearity to examine the level of tolerance and VIF for the exogenous variables. In Table 4.5, the tolerance range is between 0.488 and 0.948, which is substantially greater than 0.10, and the VIF ranges from 1.054 and 2.138 are significantly less than 10. Thus, the results indicate there is no breach of the multicollinearity problem in this study.

Table 4. 5
Test of Multicollinearity

Model	Dependent Variable	Collinearity Statistics	
		Tolerance	VIF
Optimism	Behavioural Intention	.488	2.050
Innovativeness		.492	2.032
Discomfort		.922	1.085
Insecurity		.881	1.135
Effort Expectancy		.489	2.044
Performance Expectancy		.468	2.138
Optimism	Effort Expectancy	.645	1.550
Innovativeness		.645	1.551
Discomfort		.948	1.054
Insecurity		.944	1.059
Optimism	Performance Expectancy	.579	1.726
Innovativeness		.561	1.782
Discomfort		.947	1.056
Insecurity		.908	1.101

4.5.5 Testing of Sampling Adequacy

Sampling adequacy is to test the validity of the data. Kaiser-Meyer-Olkin (KMO) and Bartlett for the test of the sphericity are used to measure the applicability of factor analysis and adequacy of sampling (Hair *et al.*, 2013). As Kaiser suggested, KMO values are considered large and meritorious if it is equal or more than 0.80, medium if it is around 0.70 and acceptable if it is around 0.60, whereas it is unacceptable if it is around 0.50 (Rusuli, 2013). Table 4.6 below shows that the result is considered as valid for further analysis.

Table 4. 6
KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.855**
Bartlett's Test of Sphericity	Approx. Chi-Square	1775.956
	df	36
	Sig.	0.000

The KMO statistic of 0.855 indicates large sampling adequacy as it is greater than 0.80. It is good enough because it is greater than the threshold 0.5 underlined by Hair *et al*. (2013). Besides that, Bartlett's Test of sphericity examines the proposition of the correlation matrix that is an individuality matrix, which would indicate that the given variables are unrelated. A significant value with less than 0.05 specifies a significant relationship between the given variables. The p-value is 0.000, which is less 0.05, thus, suggesting that the variables are highly correlated. Hence, it is good enough to interpret appropriateness and adequate correlation among the variables (Field *et al*., 2009). Table 4.6 above shows that the result is considered as valid for further analysis, where the factor analysis is considered as an appropriate technique for further analysis of the data.

4.5.6 Common Method Bias Test

Common method bias refers to the actual variables that are specific to the measurement process, rather than the actual value represented by the measured value (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Common method bias may distort the collected data due to the use of the same instrument to collect data for both endogenous and exogenous variables at the same time. Thus, by taking into account the potential problems caused by common method bias in behavioural research, this study conducts a test to ensure that there was no difference in the observed scores and that the correlation did not expand due to the effect of the method. There is a lot of controversy about the severity of the common method of bias (Bagozzi, 2011). Therefore, this is a significant observation for this study.

To treat common method variance (CMV), statistical Harman's one-factor test will be used (Podsakoff *et al*., 2003). Harman's single factor test is a commonly recognised

measure to test the common method bias. The technique is to take in all items into a single factor and conduct the principal component analysis (PCA) with the un-rotated factor solution. If the assessment findings presented that none of the constructs constituted larger than 50 percent of the total variance in the model, then common method bias is not present in the data (Podsakoff *et al*., 2003).

Table 4. 7
Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	16.365	32.731	32.731	16.365	32.731	32.731
2	4.999	9.998	42.729	4.999	9.998	42.729
3	4.071	8.143	50.872	4.071	8.143	50.872
4	2.574	5.148	56.020	2.574	5.148	56.020
5	2.377	4.753	60.773	2.377	4.753	60.773
6	1.669	3.338	64.111	1.669	3.338	64.111
7	1.549	3.098	67.209	1.549	3.098	67.209
8	1.266	2.532	69.741	1.266	2.532	69.741
9	1.075	2.149	71.890	1.075	2.149	71.890
10	1.001	2.002	73.892	1.001	2.002	73.892
11	.870	1.741	75.632			

Extraction Method: Principal Component Analysis.

The Harman's one-factor test uses to detects whether all items are loaded into a single factor or not, by examining all items for all variables together with the Principal Component Analysis. According to Table 4.7, the Principle Component Analysis revealed that all of the items forming 10 factors with the total variance of 73.89 percent at eigenvalues 1.001, and the biggest factor had made up 32.73 percent of the variance. Un-Rotated factor analysis showed that 50 items of all variables studied showed that no single factor accounted for more than 50 percent of the variance. Thus, the results show there was no common method bias exist in this study as Podsakoff *et al*. (2003) and Lowry and Gaskin (2014) that argued that there is common method bias while a single factor interprets more than 50 percent of the variance.

Besides that, the communalities are assessed to reveal an explanation of the number of variables is in each of the original variables. There is exclusion from the analysis where the items have less than 50 percent verified a communality for a variable. Therefore, the factor solution will contain less than half the variance in the original variable, and the explanatory power of that variable is not well represented, hence higher communalities are desirable (Hair *et al*., 2013). Appendix I illustrates the communalities of all the measurement items are more than 0.50, which in the range of 0.635 and 0.828. Thus, no variable will be excluded based on low communalities.

4.5.7 Testing of Non-Response Bias

Non-response happens when respondents who are given questionnaires do not react to them in the study (Zikmund *et al*., 2010). Along these lines, non-response bias alludes to a measurable distinction between the respondents who reacted to questionnaires distributed and the individuals who neglected to respond in a survey (Zikmund *et al*., 2010). To measure the possible of non-response bias, it is recommended that the responses of early respondents and late respondents should be compared (Armstrong & Overton, 1977). Armstrong and Overton contend that non-respondents offer comparable components with late respondents.

The time gap between the early respondents and the late respondents which may pose a threat for the generalizability of the findings of the study as time spent for data collection in this study was carried out over the period of three months started from October 2018 to December 2018. To test non-response bias, the t-test is used to compare the similarities between the mean, and standard error means of early response group late response group. Following the suggestions of Armstrong and Overton (1977) and Tan, Kannan, Handfield and Ghosh (1999), if the differences between late and

early responses are found to be significant, they may indicate the underlying differences between participants and non-participants. In this study, 253 were classified as early participants, and 234 responses were classified as late participants.

Table 4.8 shows the independent sample t-test of on all constructs.

Table 4. 8
Non-Response Bias

Construct	Response	N	t-test for Equality of Means		
			Mean Difference	Std. Error Difference	Sig. (2-tailed)
Optimism	Early Response	253	-.11559	.11222	.304
	Late Response	234	-.11559	.11178	.302
Innovativeness	Early Response	253	-.01316	.11888	.912
	Late Response	234	-.01316	.11877	.912
Discomfort	Early Response	253	-.12309	.08616	.154
	Late Response	234	-.12309	.08548	.151
Insecurity	Early Response	253	-.17616	.11272	.119
	Late Response	234	-.17616	.11375	.122
Facilitating Conditions	Early Response	253	-.18859	.10413	.071
	Late Response	234	-.18859	.10360	.069
Effort Expectancy	Early Response	253	.15879	.08293	.056
	Late Response	234	.15879	.08264	.055
Performance Expectancy	Early Response	253	.03032	.09160	.741
	Late Response	234	.03032	.09179	.741
Social Influence	Early Response	253	.05978	.10916	.584
	Late Response	234	.05978	.10887	.583
Behavioural Intention	Early Response	253	-.02659	.08623	.758
	Late Response	234	-.02659	.08614	.758

Table 4.8 describes the findings of non-response bias based on the early and late response. The table shows small differences in the mean score between the early and late responses of each construct. At large, non-response bias possessed no significant differences between early and late respondents for all variables at $p<0.05$, and it indicates no differences in the two groups of respondents. As a result, it can be concluded that the issues of non-response bias were not present in this study since

there is no violation of the assumption of equal variance between early and late respondents.

4.6 Descriptive Statistics Analysis

Descriptive statistics are the most common method of summarising data in the research. The descriptive analysis allows the research data to be summarised, analysed and much easier to be interpreted. In this study, descriptive statistics are used to provide brief descriptive information about the collected data in the study, including statistics such as the mean, the standard deviation and frequencies (Sekaran & Bougie, 2013). In the initial steps of data analysis of any given collected data, the researcher usually conducts descriptive statistics to calculate the mean, standard deviation and frequencies of the variables. Another purpose of using descriptive analysis is to understand the characteristics of the sample (Babbie, 2015).

In specific, the descriptive statistic is a numerical summary of data set, such as maximum, minimum, means, standard deviation and variance (Sekaran & Bougie, 2013). A descriptive statistics is chosen since it gives an exact description of the characteristics including for behaviour, opinions, abilities, beliefs and knowledge of an individual, group, organisation or circumstances (Sekaran & Bougie, 2013). Mean score and the standard deviation are essential to determine the central trend and the degree of variability in variable distribution. In this study, descriptive analysis was conducted to describe the general situation of all constructs. Table 4.9 and Appendix J shows the mean, standard deviation, maximum and minimum values of all the measurements items.

Table 4. 9
Descriptive statistics of the constructs

Construct	Minimum	Maximum	Mean	Std. Deviation
Optimism	1	7	5.02	1.24
Innovativeness	1	7	4.97	1.34
Discomfort	2	7	4.22	0.95
Insecurity	1	7	4.34	1.25
Facilitating Conditions	1	7	4.91	1.15
Effort Expectancy	3	7	5.26	0.92
Performance Expectancy	2	7	5.36	1.01
Social Influence	1	7	4.88	1.20
Behavioural Intention	2	7	5.35	0.95

Descriptive analysis of the means and standard deviations of constructs are presented in Table 4.9. The descriptive statistics for the constructs used in the study provide an overall mean for a range of latent variables between 4.22 and 5.36 which showing moderate to high mean score. Among the constructs, Performance Expectancy had the highest mean (M = 5.36, SD = 1.01), followed by Behavioural Intention (M = 5.35, SD = 0.95), Effort Expectancy (M = 5.26, SD = 0.92), Optimism (M = 5.02, SD = 1.24), Innovativeness (M = 4.97, SD = 1.34), Facilitating Conditions (M = 4.91, SD = 1.15), Social Influence (M = 4.88, SD = 1.20), Insecurity (M = 4.34, SD = 1.25), and the construct of Discomfort had the lowest mean (M = 4.22, SD = 1.25). However, Innovativeness has the highest standard deviation (SD = 1.34) among the constructs. All items were measured on a seven-point scale.

4.7 Assessment of Measurement Model

The first step for the analysis of PLS-SEM is the assessment of the measurement model (outer model). The outer model deals with the measurement of the component, which determines how well the indicators (items) load theoretically and associate with respective constructs. On the other hand, the outer model analysis used to confirm

reliability and validity for each survey items designed to measure. Prior running PLS-SEM analysis to evaluate the measurement model, the researcher has to confirm the survey items are reliable and valid as these are the two main criteria used in the analysis to evaluate the measurement model (Hair *et al*., 2016; Hulland, 1999; Ramayah, Lee, & In, 2011). The decision about the nature of the relationship among constructs (inner model) depends on the reliability and validity of the measures. Thus, this section will present individual item reliabilities, reliabilities of items scale, convergent validity and discriminant validity.

4.7.1 Individual Item Reliability

There was an analysis of the outer loading of each construct's measure in Table 4.10 in order to have an assessment of individual items reliability (Hair *et al*., 2010). The indicators with outer loadings below the threshold of 0.50 must be deleted (Hair *et al*., 2013). In this study, all of the measurement items have met the requirement, as stated by Hair *et al*. (2013). Thus, a total of 50 items having loadings that range between 0.67 and 0.93. As displayed, all items used are highly and significantly loaded on their corresponding construct, and they exceeded the 0.50 recommended values (Hair *et al*., 2010).

Table 4. 10
The Items Loading According to Constructs"

Individual Item for Each Construct	Research Construct								
	BI	**DI**	**EE**	**FC**	**IN**	**IY**	**OP**	**PE**	**SI**
Item 1	0.87	0.93	0.67	0.84	0.87	0.87	0.80	0.85	0.87
Item 2	0.79	0.86	0.67	0.82	0.89	0.90	0.88	0.86	0.82
Item 3	0.81	0.80	0.70	0.85	0.88	0.90	0.85	0.86	0.85
Item 4	0.80	0.72	0.79	0.84	0.89	0.85	0.85	0.82	0.85
Item 5	0.82	0.72	0.81	0.79	0.91	0.68	0.84	0.86	0.79
Item 6	0.79	-	-	-	-	-	-	-	-
Item 7	0.78	-	-	-	-	-	-	-	-
Item 8	0.81	-	-	-	-	-	-	-	-
Item 9	0.82	-	-	-	-	-	-	-	-
Item 10	0.82	-	-	-	-	-	-	-	-

Note: Where, the 'OP' abbreviation refers optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'FC' abbreviation refers to facilitating conditions. EE = effort expectancy, PE = performance expectancy, SI = social influence, and BI = behavioural intention

4.7.2 Reliabilities of items scale

In order to measure the internal consistency of the instruments in this study, reliability analysis is employed. Reliability refers to the "measure of the degree to which a set of indicators of a latent construct is internally consistent in their measurements" (Hair *et al*., 2013, p.546). Specifically, reliability represents the extent of the measure to which it is without bias. Reliability tested using Cronbach's alpha, and the value would be close to 1 to ensure the higher internal consistency reliability (Sekaran & Bougie, 2010). Generally, coefficient alpha below 0.60 represents poor reliability, fairly reliability for a value between 0.60 to 0.70, good reliability for 0.70 to 0.08, and 0.80 to 0.95 indicates very good reliability (Hair *et al*., 2016). The finding in Table 4.11 below demonstrate that all the value of Cronbach's Alpha for each variable is larger than 0.70, which considered as stable and consistent in measurement.

Table 4. 11
Reliability Analysis

Construct	No. of Items	Cronbach's Alpha Values
BI	10	0.9392
OP	5	0.8996
IN	5	0.9335
DI	5	0.8975
IY	5	0.9072
PE	5	0.9048
EE	5	0.7839
FC	5	0.8851
SI	5	0.8956

Note: Where the 'OP' abbreviation refers to optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'FC' abbreviation refers to facilitating conditions. EE = effort expectancy, PE = performance expectancy, SI = social influence, and BI = behavioural intention.

4.7.3 Convergent Validity Testing

The next analysis done by the researcher was to test the convergent validity. In measurement model analysis, the convergent validity is a rationality way where multiple items are utilised to test a concept to be confirmed (Hair *et al*., 2016). As recommended by Hair *et al*. (2016), the average variance extracted (AVE), factor loadings, and composite reliability (CR) were applied to test convergent validity. The requirements to be ensured for convergent validity are that the AVE value has to be above 0.50, CR value must be above 0.70, and the value of factor loading for each item must be above 0.50.

Table 4. 12
The Convergent Validity Assessment Result

Construct	Measurement Item	Loadings	AVE	Composite Reliability
BI	BI1	0.8665	0.6469	0.9482
	BI2	0.7944		
	BI3	0.8089		
	BI4	0.8014		
	BI5	0.7445		
	BI6	0.8178		
	BI7	0.7948		
	BI8	0.7772		
	BI9	0.8118		
	BI10	0.8200		
EE	EE1	0.9334	0.6573	0.9047
	EE2	0.8612		
	EE3	0.8013		
	EE4	0.7187		
	EE5	0.7176		
FC	FC1	0.6657	0.5300	0.8485
	FC2	0.6676		
	FC3	0.7042		
	FC4	0.7852		
	FC5	0.8055		
PE	PE1	0.8383	0.6849	0.9157
	PE2	0.8204		
	PE3	0.8505		
	PE4	0.8398		
	PE5	0.7875		
SI	SI1	0.8740	0.7900	0.9495
	SI2	0.8920		
	SI3	0.8796		
	SI4	0.8930		
	SI5	0.9052		
OP	OP1	0.8700	0.7160	0.9258
	OP2	0.9046		
	OP3	0.9024		
	OP4	0.8524		
	OP5	0.6811		
IN	IN1	0.8020	0.7130	0.9254
	IN2	0.8795		
	IN3	0.8475		
	IN4	0.8544		

	IN5	0.8368		
DI	DI1	0.8502	0.7239	0.9291
	DI2	0.8605		
	DI3	0.8605		
	DI4	0.8244		
	DI5	0.8632		
IY	IY1	0.8721	0.7038	0.9223
	IY2	0.8233		
	IY3	0.8525		
	IY4	0.8503		
	IY5	0.7943		

Note: Composite Reliability **(CR)** = (square of the summation of the factor loadings) / [(square of the summation of the factor loadings) + (square of the summation of the error variances)]; Average Variance Extracted **(AVE)** = (summation of the square of the factor loadings) / [(summation of the square of the factor loadings) + (summation of the error variances)]. Where the 'OP' abbreviation refers to optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'FC' abbreviation refers to facilitating conditions. EE = effort expectancy, PE = performance expectancy, SI = social influence, and BI = behavioural intention.

Results in Table 4.12 shows that the value of AVE for all the constructs was more than the threshold value of 0.50 (Hair *et al*., 2013; Reinartz *et al*., 2009). The finding shows that the AVE values range from 0.5298 to 0.7900; so, it can be concluded that convergent validity is established, and this had indicated a good level of the construct validity of measures used.

Besides, according to Hair *et al*. (2016), Cronbach alpha assumes that all indicators are equally reliable and often underestimate the reliability of internal consistency. Due to Cronbach alpha's limitation, CR has been suggested as an appropriate measure of internal consistency because it takes to account the different outer loadings of indicators variables and PLS-SEM gives priority to the indicators according to their individual reliability (Peterson & Kim, 2013; Raykov, 1998). As depicted in Table 4.12, and all of the CR values for each variable and all the loading values for each measurement item are meet the requirements to ensure convergent validity. The CR

value and loading show an exceeds of the suggested threshold of 0.7 and 0.50 above. Thus, it is showing the satisfactory contribution of the indicators to assigned constructs. The result shows that the constructs of this study fully achieve the convergent requirements, assuming that the constructs used can measure the concept of the study.

4.7.4 Discriminant Validity

Discriminant validity shows how far a construct in term of degree essentially differs from other constructs. On the other hand, the measures of constructs are not theoretically related to each other (Churchill, 1979; Hair *et al*., 2013). The most common method of assessing the effectiveness of discriminant validity is the Fornell-Larcker criterion (Hair *et al*., 2016). The discriminant validity is identified when the square root of AVE value of each construct is greater than the highest correlation of the construct with any other latent construct (Hair *et al*., 2016; Henseler, Ringle, & Sinkovics, 2009).

Table 4. 13
Discriminant Validity Analysis

Latent Construct	BI	DI	EE	FC	IN	IY	OP	PE	SI
BI	**0.804**								
DI	-0.119	**0.811**							
EE	0.626	-0.033	**0.728**						
FC	0.443	-0.106	0.438	**0.828**					
IN	0.592	-0.062	0.603	0.311	**0.889**				
IY	-0.064	0.265	0.069	0.088	-0.070	**0.846**			
OP	0.537	-0.029	0.566	0.416	0.601	-0.070	**0.844**		
PE	0.667	-0.086	0.592	0.309	0.647	-0.090	0.630	**0.851**	
SI	0.480	-0.084	0.524	0.674	0.385	0.114	0.486	0.369	**0.839**

Note: Where the 'OP' abbreviation refers to optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'FC' abbreviation refers to facilitating conditions. EE = effort expectancy, PE = performance expectancy, SI = social influence, and BI = behavioural intention.

Thus, discriminant validity is assessed in the present study to compare the square root of the AVE for each construct with the correlation presented in the correlation matrix. Table 4.13 presents the outcomes of the Fornell-Larcker Criteria test with the square root of the construct. The square root of AVE in bold is larger than the correlation of other constructs. As the conclusion, there is the establishment of the construct's discriminant validity.

4.8 Assessment of Structural Model

The assessment of the structural model was examined after determining the suitability of the measures in the conceptual research model. The structural model aspect of PLS-SEM is based on the establishment of variance explained R square (R^2) of the model and the significance of all the estimated path coefficients (Hair *et al*., 2009). Thus, the PLS algorithm style approach is used in this study to obtain R^2 for endogenous variables, while bootstrapping technique are used to get the significances of all the path coefficients between endogenous and exogenous variables.

Bootstrapping technique is applied to test the significance of the path coefficient since the PLS assumes that the used data are not normally distributed and consequently, the non-parametric bootstrap procedure needs to apply to get the significance of inner weight (Hair *et al*., 2009). Additionally, effect size (f^2) assessment, assessment of prediction quality (Q^2 Value), and assessment of Goodness-of-Fit (GOF) are used to verify the structural model. Once the goodness of the outer model had been confirmed, the next step was to identify the hypothesised relationship among the variables (Fernandes, 2012; Hair *et al*., 2016).

4.8.1 Structural Model Specification

The research model consists of night constructs that represent a different category of variables. Latent variables are measured directly by the observed variables. Moreover, latent variables are divided into exogenous and endogenous latent variables (Byrne, 2013). In this study, the latent variables are the behavioural intention (BI), optimism (OP), innovativeness (IN), discomfort (DI), insecurity (IY), facilitating conditions (FC), effort expectancy (EE), performance expectancy (PE) and social influence (SI).

To understand and describe the variance and measure the quality of the endogenous model variables, R^2 values of the endogenous variables of the specification of the structural model is used to assess each variable quality in the structural model. The R^2 is used to measure the squared correlation between a specific endogenous construct's actual and predicted value, and it also represented the combined effects of exogenous latent variables toward the endogenous latent variable. The value of R^2 is range from 0 to 1, with higher levels indicating a higher level of predictive accuracy. Thus, the acceptable R^2 value depends on the complexity of the model (Hair *et al*., 2016). By referring to the criteria provided by Cohen (1988), the R^2 value more than 0.32 consider substantial, 0.15 moderate and 0.02 weak. Communality value which greater than 0.50 also one of the requirements of the study (Rajalahti & Kvalheim, 2011). Furthermore, the redundancy value for all construct are must be very small to act as additional support in this study.

In this study, as stated in Table 4.14, R^2 values of the total three endogenous variables are categorised at a substantial level, which the R^2 value of BI is 0.5731, PE for 0.5124 and the R^2 value of EE is 0.4441, where all of the R^2 value exceeds 0.32 (J. Cohen, 1988). Furthermore, according to Falk and Miller (1992), 0.10 is the cut-off value of

R^2, and that 0.10 represents an acceptable level of explained variance for that particular variable. The base of the finding, none of the variable was categorised under this category.

Moreover, further support can be investigated by using communality value, which the requirement should be not below than 0.50. All of the constructs with the communality value are range from 0.5300 to 0.7900 in the study where the communality values support it must above 0.50. Meanwhile, the very small redundancy values for a total of five endogenous constructs in this study is supported.

Table 4. 14
Structural Model Specification for Individual Latent Variables

Construct	Level of Construct	R Square	Redundancy	Communality
BI	First Order	0.5731***	0.0049	0.6469
OP	First Order	Predictor	Predictor	0.7130
IN	First Order	Predictor	Predictor	0.7900
DI	First Order	Predictor	Predictor	0.6573
IY	First Order	Predictor	Predictor	0.7160
PE	First Order	0.5124***	0.0040	0.7239
EE	First Order	0.4441***	0.0003	0.5300
FC	First Order	Predictor	Predictor	0.6849
SI	First Order	Predictor	Predictor	0.7038

Note: Significant level R^2 (Cohen, 1988): >0.32 (Substantial)***, >0.15 (moderate)**, >0.02 (weak)*. Where, the 'OP' abbreviation refers optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'FC' abbreviation refers to facilitating conditions. EE = effort expectancy, PE = performance expectancy, PE = performance expectancy, SI = social influence, and BI = behavioural intention.

Generally, after discussed and illustrated the structural model specification, all constructs have accomplished all the basic requirements for the structural model specification in order to verify the structural model of the research. The information in the structural model specification is clarified in Table 4.14 above and Figure 4.7 below for first-order constructs.

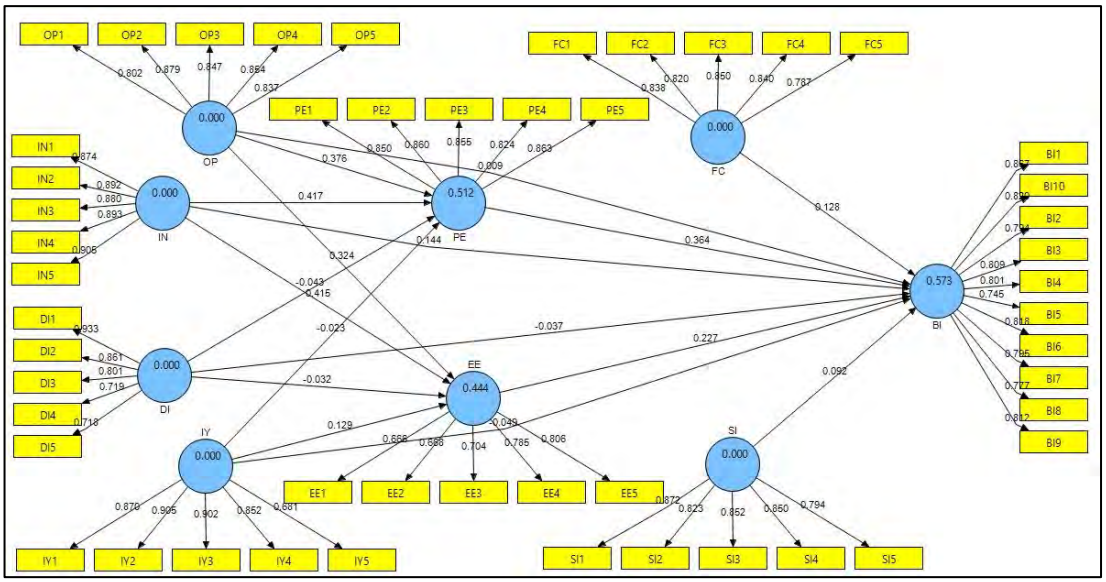


Figure 4. 7: An Overview of the Structural Model for Individual Latent Variables

Note: Where, the 'OP' abbreviation refers optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'FC' abbreviation refers to facilitating conditions. EE = effort expectancy, PE = performance expectancy, PE = performance expectancy, SI = social influence, and BI = behavioural intention.

4.8.2 Estimates for Path Coefficients

Path coefficients in structural model relationships indicated the strength and direction of the relationship between endogenous and exogenous latent variables. The confidential intervals of path coefficients were determined through the bootstrapping technique. The bootstrapping technique uses the repeated random sampling with replacement from the original sample in order to create bootstrap samples which eventually obtain standard errors for hypothesis testing (Hair *et al*., 2011, 2014). Furthermore, the cases number of the usable sample (n = 487) was set in advance before running the bootstrapping in PLS 2.0, and the number of bootstrap samples was set to 5,000 based on the suggestion from Hair *et al*. (2014).

The path coefficients have standardised values just about between –1 and +1, where values can be smaller or larger but usually, fall in between these bounds. Estimated path coefficients near to +1 represent strong positive relationships and vice versa for

negative values that are usually statistically significant. The nearer the estimated coefficients to 0, the weaker are the relationships. In specific, the value which is close to 0 is generally not significantly different from zero. Furthermore, the structural model path coefficients can be construed relative to one another. If one path coefficient is greater than another, its effect on the endogenous latent variable is larger. In general, the individual path coefficients of the path model can be understood just like the standardised beta coefficients (Hair *et al*., 2016).

According to Hair *et al*. (2014), path coefficients with standardised values more than 0.20 are always significant, and those with values below 0.10 are commonly not significant. To confirm whether the part coefficients are statistically significant or not, T-values with each path coefficient were generated. Therefore, this part of the findings will present the path relationship and direction between constructs in this study. Table 4.15 and Figure 4.8 shows that there is a total of 8 significant positive relationships exist at a significant level of $p<0.01$, 1 significant positive relationship for $p<0.10$, and 1 significant positive relationship for $p<0.05$. The part coefficients value for this study ranges between -0.0235 and 0.4154. This study also shows that the small value of their coefficient will lead to an insignificant relationship between constructs. Thus, there is a total of 6 path relationships is insignificant.

Table 4. 15

Path Coefficient Estimates

Path Relationship	Path Coefficient	Sample Mean	Standard Deviation	Standard Error	T Statistics
DI -> BI	-0.0373	-0.0365	0.0518	0.0518	0.7194
DI -> EE	-0.0317	-0.0315	0.0435	0.0435	0.7279
DI -> PE	-0.0432	-0.0434	0.0447	0.0447	0.9672
EE -> BI	0.2266	0.2263	0.0704	0.0704	3.2209***
FC -> BI	0.1284	0.1276	0.0522	0.0522	2.4575**
IN -> BI	0.1436	0.1425	0.0436	0.0436	3.2962***
IN -> EE	0.4154	0.415	0.0483	0.0483	8.5994***
IN -> PE	0.4168	0.4147	0.0579	0.0579	7.2026***
IY -> BI	-0.0494	-0.0477	0.0337	0.0337	1.4664
IY -> EE	-0.1289	0.1259	0.0377	0.0377	3.4163***
IY -> PE	-0.0235	-0.0219	0.0344	0.0344	0.6823
OP -> BI	0.0091	-0.0094	0.0635	0.0635	0.1425
OP -> EE	0.3244	0.3257	0.0559	0.0559	5.8046***
OP -> PE	0.3761	0.3778	0.0619	0.0619	6.0746***
PE -> BI	0.3636	0.3648	0.0521	0.0521	6.9811***
SI -> BI	0.0924	0.0935	0.0523	0.0523	1.7682*

Note: * *Significant at p<0.10, ** Significant at p<0.05, ***Significant at p<0.01 base on two-tailed t-statistics, as t-value greater than 1.65, 1.96, and 2.58.* Where, the 'OP' abbreviation refers optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'FC' abbreviation refers to facilitating conditions. EE = effort expectancy, PE = performance expectancy, SI = social influence, and BI = behavioural intention.

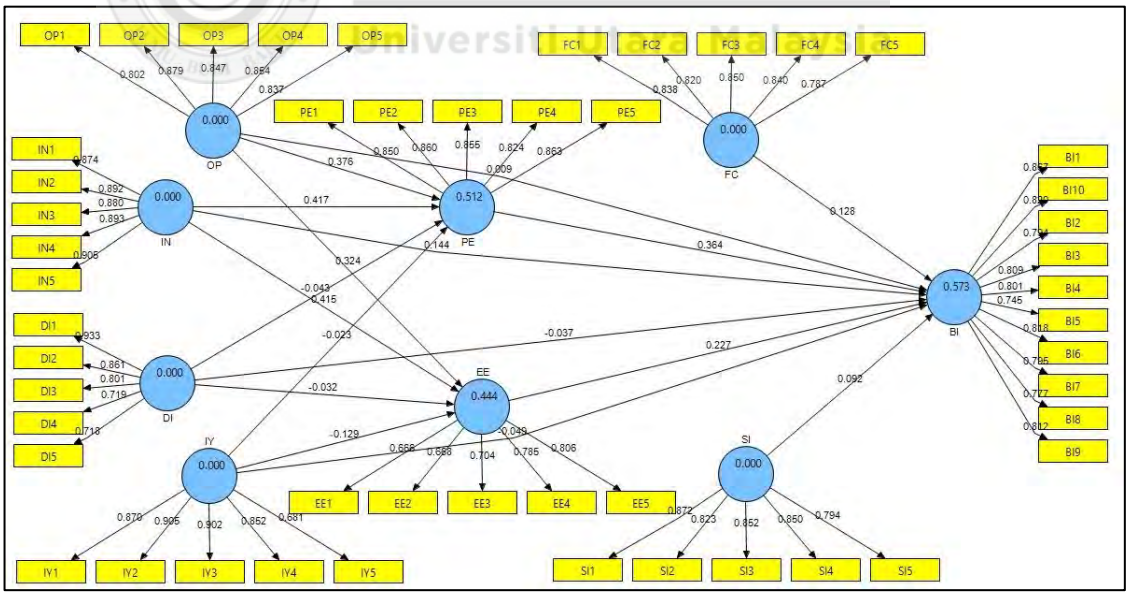


Figure 4. 8: Path Analysis Result for Research Model

Note: Where, the 'OP' abbreviation refers optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'FC' abbreviation refers to facilitating conditions. EE = effort expectancy, PE = performance expectancy, PE = performance expectancy, SI = social influence, and BI = behavioural intention.

4.8.3 Assessment of Effect Size (f^2)

In order to have an additional assessment of the value of all endogenous variables, the effect size is evaluated in the study. This has shown the influence of specific exogenous latent variables on endogenous latent variables through changes of mean in R^2 (Chin, 1988). In simple words, the effect size is the difference in R^2 between the main effects when the particular exogenous construct is in the model, and when it is omitted from the model. This is a purposeful assessment of whether the omission of exogenous constructs has a significant effect on endogenous variables (Hair *et al*., 2013). According to Hair *et al*. (2016), the following formula shows how the effect size (f^2) was calculated:

$$\text{Effect Size } (f^2) = \frac{R^2_{included} - R^2_{excluded}}{1 - R^2_{included}}$$

For the effect size or f^2, the value of f^2 can be divided into three intervals. For the first interval, the f^2 value that falls at 0.02 but smaller than 0.15 will shows that the exogenous of the latent variable has a small effect at the structural model. In the second interval, the f^2 value that falls at 0.15 but smaller than 0.35 will indicates that the predictor of the latent variable has a medium effect at the structural model. For the third interval, the f^2 value that is at 0.35 or larger than 0.35, it represents that the predictor of the latent variable has a large effect at the structural model (Cohen, 1988).

The effect size of the latent variable in the study is described in Table 4.16 below. The exogenous constructs (DI, EE, IN, IY, OP and PE) for explaining the endogenous variable (BI) have effect sizes of 0.037, 0.914, 0.823, 0.018, 0.689 and 1.041 respectively. The effect size of each of the exogenous constructs on the BI as an

endogenous construct which EE, IN, OP and PE are categorising as large, while effecting sizes of DI is small and, there is a very weak effect of IY towards BI.

Additionally, OP and IN shows a large effect on EE with the value of 0.575 and 0.726, followed by the medium effect of DI and IY with the value of 0.155 and 0.175. Besides that, IN and OP show a large effect on PE with 0.874, and 0.820 respectively. However, DI and IY show a very weak effect on PE.

Table 4. 16
Assessment of Effect Size of the Individual Latent Construct on the Research Model

Construct	Included Value	Excluded Value		f2	Sign
	R2 Individual Model	R2 Full model	R2 Excluded		
f^2 DI -> BI	0.0156	0.5731	0.5575	0.037	*
f^2 DI -> EE	0.0864	0.4441	0.3577	0.155	**
f^2 DI -> PE	0.0082	0.5124	0.5042	0.017	-
f^2 EE -> BI	0.3904	0.5731	0.1827	0.914	***
f^2 IN -> BI	0.3515	0.5731	0.2216	0.823	***
f^2 IN -> EE	0.4037	0.4441	0.0404	0.726	***
f^2 IN -> PE	0.4264	0.5124	0.0860	0.874	***
f^2 IY -> BI	0.0076	0.5731	0.5655	0.018	-
f^2 IY -> EE	0.0972	0.4441	0.3469	0.175	**
f^2 IY -> PE	0.0090	0.5124	0.5034	0.018	-
f^2 OP -> BI	0.2940	0.5731	0.2791	0.689	***
f^2 OP -> EE	0.3199	0.4441	0.1242	0.575	***
f^2 OP -> PE	0.3998	0.5124	0.1126	0.820	***
f^2 PE -> BI	0.4464	0.5731	0.1267	1.046	***

Note: According to Cohen (1988), f^2 is assessed as: >0.35 (Large)***, >0.15 (medium)**, >0.02 (small)*. Where, the 'OP' abbreviation refers optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'FC' abbreviation refers to facilitating conditions. EE = effort expectancy, PE = performance expectancy, SI = social influence, and BI = behavioural intention.

4.8.4 Assessment of Predictive Relevance (Q-squared statistics)

In order to measure the structural model quality by seeing effect sizes and the R^2 value, the redundancy of the cross-validation can also be generated by using the blindfolding procedure in order to test the predictive correlation. As mentioned by Hair *et al*. (2011), the structural model and the measurement model are estimated by PLS-SEM to

evaluate the cross-validation redundancy with predictive data, which is in full compliance with the PLS-SEM method. If the Q^2 value for an endogenous construct is greater than zero, its explanatory latent constructs have predictive relevance. In order to obtain Q^2, the Stone-Geisse test or the Q-square is conducted on evaluating the model to predict the data of omitted cases, which is called predictive relevance (Garson, 2016).

Table 4. 17
Predictive Relevance (Q^2)

Construct	R^2 Value	Q^2 Value	Acceptability of Predictive Relevance
BI	0.5731	0.3659	**Yes**/No
EE	0.4441	0.2235	**Yes**/No
PE	0.5124	0.3661	**Yes**/No

Note: The predictive relevance for the specific variable is good at $Q^2>0$. Where the 'FC' abbreviation refers to facilitating conditions. EE = effort expectancy, PE = performance expectancy, SI = social influence, and BI = behavioural intention.

The results in Table 4.17 above show that all the Q^2 values are larger than zero access to BI (0.3659), EE (0.2235) and PE (0.3661) for a research model; this suggests a substantial predictive relevance of the model. This is in line with the suggestions of Garson (2016), Hair *et al*. (2013) and Reinartz *et al*. (2009), the Q^2 values for all of the endogenous variables are bigger than zero value; therefore, the model is proved to have predictive validity.

As shown in Table 4.17, the Q^2 values for all of the endogenous variables are bigger than zero, which has represented a good predictive relevance. Nevertheless, the function of Q-square statistics is inadequate to measure the existence of predictive validity as it only measures in indicator level. Thus, this study uses to calculate the q^2 values to evaluate the relative influence for each of the exogenous constructs on an endogenous construct by using the formula below that provided by Hair *et al*. (2016):

$$q^2 = \frac{Q^2_{included} - Q^2_{excluded}}{1 - Q^2_{included}}$$

Based on the rule of thumb, the q^2 value of 0.02, 0.15 and 0.35 show small, medium and large predictive relevance of the exogenous construct have on the endogenous construct (Henseler *et al*., 2009). As portrayed in Table 4.18 below, the q^2 value for EE, PE and IN have a large effect size of predictive relevance for BI, and the OP has a medium effect size of predictive relevance, but DI and IY have a weak effect size of predictive relevance for BI. Additionally, IN and OP have a medium effect size of predictive relevance for EE, but DI and IY have a small effect size of predictive relevance for EE. Last but not least, IN and OP have a large effect size of predictive relevance for PE, but DI and IY have a very small effect size of predictive relevance for PE.

Table 4. 18
The relative impact of predictive relevance on observed measures of the structural model for individual latent variables (First Order)

Latent Construct	Q^2 Individual Model	Included Value Q^2 Full Model	Excluded Value Q^2 Excluded	q^2	Sign
q^2DI → BI	0.0078	0.3659	0.3581	0.0123	-
q^2DI → EE	0.0177	0.2235	0.2058	0.0228	*
q^2DI → PE	0.0053	0.3661	0.3608	0.0084	-
q^2EE → BI	0.2500	0.3659	0.1159	0.3943	***
q^2IN → BI	0.2243	0.3659	0.1416	0.3537	***
q^2IN → EE	0.1852	0.2235	0.0383	0.2385	**
q^2IN → PE	0.3009	0.3661	0.0652	0.4747	***
q^2IY → BI	0.0026	0.3659	0.3633	0.0041	-
q^2IY → EE	0.0230	0.2235	0.2005	0.0296	*
q^2IY → PE	0.0062	0.3661	0.3599	0.0098	-
qf^2OP → BI	0.1840	0.3659	0.1819	0.2902	**
q^2OP → EE	0.1595	0.2235	0.0640	0.2054	**
q^2OP → PE	0.2867	0.3661	0.0794	0.4523	***
q^2PE → BI	0.2834	0.3659	0.0825	0.447	***

Note: According to Henseler *et al.* (2009), q^2 is assessed as: >0.35 (Large)***, >0.15 (medium)**, >0.02 (small)*. Where, the 'OP' abbreviation refers optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'FC' abbreviation refers to facilitating conditions. EE = effort expectancy, PE = performance expectancy, SI = social influence, and BI = behavioural intention.

After the calculation of q^2 values which presented in Table 4.18, all of the latent constructs show a predictive relevance value to represent the relatively large, medium and weak effect of predictive relevance on the observed measures of latent variables. Thus, all of these constructs of this study have exceeded the standards to confirm the predictive relevance and the quality of prediction for the structural model.

4.8.5 Assessment of Goodness-of-Fit (GoF)

In the method of partial least squares (PLS), the global standard of goodness-of-fit (GoF) is applied to measure the entire model. GoF for PLS is the geometric mean of the average communality and average R square for the endogenous constructs. For this purpose, GoF evaluates the variance extracted by both inner and outer models (Tenenhaus, Vinzi, Chatelin, & Lauro, 2005).

However, there are many arguments on the usefulness of this criterion on the validating model (Hair *et al*., 2013; Henseler & Sarstedt, 2013). On the one hand, Tenenhaus, Vinzi, Chatelin and Lauro, (2005) propose that GoF can be applied to PLS-SEM to compare performances produced by models. Tenenhaus *et al*. (2005) state that the GoF modelled by the PLS path is defined as the average R^2 of the endogenous constructs and the geometric mean of average communality. In addition, Henseler and Sarstedt (2013) questioned the applicability of GoF in PLS-SEM because their simulation results indicate that it is not valid for model validation but can be used to assess how the model explains different data sets. Hence, according to the guidelines set up by Wetzels, Odekerken-Schroder and Oppen (2009), they have given the following formula:

$$GoF = \sqrt{\overline{R^2} \times \overline{AVE}}$$

By following the mentioned formula above, the GoF value for this study is calculated in Table 4.19 below. According to the recommendations emphasised by Wetzels, Odekerken-Schröder, and Oppen (2009), the GoF value can be assessed through GoF baseline value where GoF value can be described as small (0.10), medium (0.25), and large (0.36).

Table 4. 19
GoF for Structural Model of Research Model

Construct	R Square	Communality	Redundancy
BI	0.5731	0.6469	0.0049
OP	-	0.7130	-
IN	-	0.7900	-
DI	-	0.6573	-
IY	-	0.7160	-
PE	0.5124	0.7239	0.0040
EE	0.4441	0.5300	0.0003
FC	-	0.6849	-
SI	-	0.7038	-
∑x/n	0.169955556	0.685088889	
$[(\sum xR^2)/n]\times [(\sum xComm)/n]$		0.116434663	
Goodness of Fit (GoF)		**0.341225238****	

Note: According to Wetzels *et al*. (2009) for global validation of PLS models, GoF_{small} = 0.10*, GoF_{medium} = 0.25**, and GoF_{large} = 0.36***. Where, the 'OP' abbreviation refers optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'FC' abbreviation refers to facilitating conditions. EE = effort expectancy, PE = performance expectancy, SI = social influence, and BI = behavioural intention.

For the present study, the structural model of individual latent constructs exhibited a GoF value of 0.398, exceeding the cut-off value of 0.36 for a large effect. This value sets an indication that the variables in the structural model fit nicely to each other. This showed that the model GoF measure is more towards large, indicating an adequate global PLS model validity. Thus, the structural models of the study are occupied enough prediction power for prediction purposes.

4.9 The Assessment of Mediating Effect

The model theorised that the relationship between behavioural intention and four exogenous variables of performance expectancy, namely effort optimism, innovativeness, discomfort and insecurity, where performance expectancy was expected to be the mediator of these relationships. Other than that, effort expectancy also believes in mediating the relationship between optimism, innovativeness, discomfort and insecurity towards the behavioural intention to use e-wallet transaction via QR code.

The analysis of the mediating effect was based on Preacher and Hayes (2008) and Baron and Kenny (1986) approach, which also recommended by Hair *et al*. (2014). The analysis involved bootstrapping the sampling distribution of the direct and indirect effect. The prerequisite for this analysis requires both direct path relationship between exogenous variables, mediator and the endogenous variable, and the indirect path relationship must be significant. If the indirect effect was significant, the mediator might absorb some of the direct effects. How much the mediator absorbs the size of the variance determined the direct effect accounted for (VAF) where direct effect plus indirect effect was computed.

Examining Table 4.20 below, there is total one exogenous construct that has a direct effect on behavioural intention, which is innovativeness. The direct effect of innovativeness to behavioural intention was significant at $\beta = 0.1493$, $t = 3.7658$ ($p<0.01$). Nevertheless, the direct effect of discomfort to behavioural intention was to be insignificant at $\beta = -0.0412$, $t = 0.7772$ ($p<0.01$), insecurity to behavioural intention was insignificant at $\beta = -0.0588$, $t = 1.2303$ ($p<0.01$) and optimism to behavioural intention was insignificant at $\beta = 0.009$, $t = 0.1477$ ($p<0.01$).

Table 4. 20
Direct Effect

Direct Relationship	Path Coefficient	Sample Mean	Standard Deviation	Standard Error	T Statistics
DI -> BI	-0.0412	-0.0464	0.053	0.053	0.7772
IN -> BI	0.1493	0.1489	0.0397	0.0397	3.7658***
IY -> BI	-0.0588	-0.0518	0.0478	0.0478	1.2303
OP -> BI	0.009	0.0123	0.0612	0.0612	0.1477

Note: ** Significant at p<0.10, ** Significant at p<0.05, ***Significant at p<0.01 base on two-tailed t-statistics, as t-value greater than 1.65, 1.96, and 2.58.* Where, the 'OP' abbreviation refers optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'FC' abbreviation refers to facilitating conditions. EE = effort expectancy, PE = performance expectancy, SI = social influence, and BI = behavioural intention.

Table 4.21 below reveals the relationship between exogenous variables and mediator (performance expectancy and effort expectancy) which is "path a" in an attempt to evaluate these paths. The direct relationship between innovativeness and performance expectancy (β= 0.4168, t= 7.2026, p<0.01) indicates the significance of the relationship at the 0.01 significance level. While, the direct relationship between optimism and performance expectancy also shown a significant relationship (β= 0.3761, t= 6.0746, p<0.01), but there is an insignificant relationship for two exogenous variables, namely discomfort and insecurity towards the performance expectancy.

On the other hand, the direct relationship between optimism and effort expectancy (β= 0.3244, t= 5.8046, p<0.01) shows that the relationship is significant at the level of significance of 0.01. Similarly, the direct relationship between innovativeness and effort expectancy (β= 0.4154, t= 8.5994, p<0.01) indicates the significance of the relationship at the 0.01 significance level. While, the direct relationship between insecurity and effort expectancy shown a significant relationship (β= -0.1289, t= 3.4163, p<0.01), but the insignificant relationship for discomfort towards effort expectancy (β= -0.0317, t= 0.7279, p<0.01).

It is evident from Table 4.21 below also show the direct relationship between the mediator and endogenous variables (path b), which are performance expectancy and effort expectancy. The relationships indicate as significantly influence on the behavioural intention at 0.01 level of significance for the mediator of performance expectancy (β= 0.3682, t= 7.1127, p<0.01), and significantly influence behavioural intention at 0.01 level of significance for the mediator of effort expectancy (β= 0.2266, t= 3.2209, p<0.01). In order to obtain (c'), Table 4.21 displays the outcomes of the analysis of the exogenous variables of performance expectancy and effort expectancy via direct paths, in the presence of performance expectancy and effort expectancy. Furthermore, Table 4.21 shows that innovativeness significantly influences behavioural intention at the 0.01 significance level (β= 0.1459, t= 3.2962, p<0.01). However, there is an insignificant relationship for the exogenous variables, namely optimism, discomfort and insecurity.

Table 4. 21
Mediation Effect

Paths	Hypothesised Path	Path Coefficient	Standard Error	T-Value
Path a	OP → PE	0.3761	0.0619	6.0746
	IN → PE	0.4168	0.0579	7.2026
	DI → PE	-0.0432	0.0447	0.9672
	IY → PE	-0.0235	0.0344	0.6823
	OP → EE	0.3244	0.0559	5.8046
	IN → EE	0.4154	0.0483	8.5994
	DI → EE	-0.0317	0.0435	0.7279
	IY → EE	0.1289	0.0377	3.4163
Path b	PE → BI	0.3636	0.0521	7.1127
	EE → BI	0.2266	0.0704	3.2209
Path c	OP → BI	0.0091	0.0627	0.1425
	IN → BI	0.1436	0.0539	3.2962
	DI → BI	-0.0373	0.0582	0.7194
	IY → BI	-0.0494	0.0390	1.4664
Path c'	EE → BI	0.2241	0.0691	3.2456
	OP → BI	0.0135	0.0627	0.2158
	IN → BI	0.1459	0.0441	3.3070
	DI → BI	-0.0010	0.0483	0.0214
	IY → BI	-0.0539	0.0325	1.6605

Indirect Paths (a*b)	OP → PE → BI	0.1367	0.0308	4.4407
	IN → PE → BI	0.1515	0.0790	1.9184
	DI → PE → BI	-0.0157	0.0167	0.9379
	IY → PE → BI	-0.0085	0.0127	0.6733
	OP → EE -→ BI	0.0735	0.0290	2.5310
	IN → EE → BI	0.0941	0.0275	3.4263
	DI → EE → BI	-0.0072	0.0161	0.4469
	IY → EE → BI	0.0292	0.0143	2.0487

Note: Where, the 'OP' abbreviation refers optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'FC' abbreviation refers to facilitating conditions. EE = effort expectancy, PE = performance expectancy, SI = social influence, and BI = behavioural intention.

In order to investigate the indirect effects of an exogenous variable on the endogenous variable via a mediator (paths a*b), the bootstrapping method was used, which is a nonparametric approach based on resampling methods. It is employed for the estimation of indirect paths in order to indicate its significance. It is included in Smart-PLS and utilised to test mediation hypotheses in this study. To determine the size of the indirect effect, VAF formula, as stated in Chapter 3 was adopted. The formula will help in determining the extent to which the exogenous variable directly interprets the variance of the endogenous variable, and how many variances are explained by the indirect relation of the mediating variable.

First, for the OP → PE →BI relationship (β= 0.1367, t= 4.4407, p<0.01), evidencing that the relationship is significant. This relationship shows full mediation of performance expectancy between the relationship optimism and performance expectancy, given the VAF value, which is 93.76 percent by referring to the calculation below:

$$VAF = \frac{0.3761 \times 0.3636}{0.3761 \times 0.3636 + 0.0091} = 0.9376$$

Second, the IN → PE → BI relationship is significant with the following results (β= 0.1515, t= 1.9184, p<0.05); hence, the relationship is significant (p<0.01) with 51.35 percent of VAF value as calculated below, which means that optimism has a partial mediating effect in this relationship.

$$VAF = \frac{0.4168 \times 0.3636}{0.4168 \times 0.3636 + 0.1436} = 0.5135$$

Third, the OP → EE → BI relationship is indirect with the following results (β= 0.0735, t= 2.5310, p<0.10); hence, the relationship is significant with 88.98 percent of VAF value as calculated below, which means that effort expectancy has a full mediating effect in this relationship.

$$VAF = \frac{0.3244 \times 0.2266}{0.3244 \times 0.2266 + 0.0091} = 0.8899$$

Next, the IN → EE → BI relationship is significant with the following results (β= 0.0941, t= 3.1263, p<0.01); hence, the relationship is significant (p<0.01) with 39.60 percent of VAF value as calculated below, which means that optimism has a partial mediating effect in this relationship.

$$VAF = \frac{0.4154 \times 0.2266}{0.4154 \times 0.2266 + 0.1436} = 0.3960$$

Lastly, the IY → EE → BI relationship is indirect with the following results (β= -0.0292, t= 2.0487, p<0.10); hence, the relationship is significant with 37.16 percent of VAF value as calculated below, which means that effort expectancy has a partial mediating effect in this relationship.

$$VAF = \frac{|-0.1289| \times 0.2266}{|-0.1289| \times 0.2266 + |-0.0494|} = 0.3716$$

Thus, overall, the result indicates that performance expectancy does not mediate the relationship between exogenous variables (discomfort, and security) and the endogenous variable (behavioural intention) in this study. Additionally, both effort expectancy and innovativeness with the mediator toward behavioural intention relationship shows a partial mediation of performance expectancy while optimism showed a full mediation effect in this study.

4.10 The Assessment of Moderating Effect

Moderating variable is the variable that moderates the strength of causal effects from independent variable X, to its dependent variable Y, Let M, said to be a moderator variable in the X-Y relationship. The moderation effects of M would "alter" the causal effects of independent variable X on dependent variable Y (Hair *et al*., 2013).

Figure 4.9 showed the results of moderation effect. It could be seen from the figure below that there is no moderation effect of facilitating conditions on the relationship between optimism ($\beta = 0.0571$, $t = 0.1130$, $p > 0.01$), innovativeness ($\beta = -0.2138$, $t = 0.5422$, $p > 0.01$), discomfort ($\beta = 0.2510$, $t = 1.0283$, $p > 0.01$) and insecurity ($\beta = 0.4399$, $t = 2.5643$, $p > 0.01$). Besides that, there is no moderation effect of social influence on the relationship between optimism ($\beta = -0.2938$, $t = 0.7084$, $p > 0.01$), innovativeness ($\beta = -0.2080$, $t = 0.5532$, $p > 0.01$), discomfort ($\beta = -0.1571$, $t = 0.6093$, $p > 0.01$) and insecurity ($\beta = -0.1664$, $t = 0.6008$, $p > 0.01$).

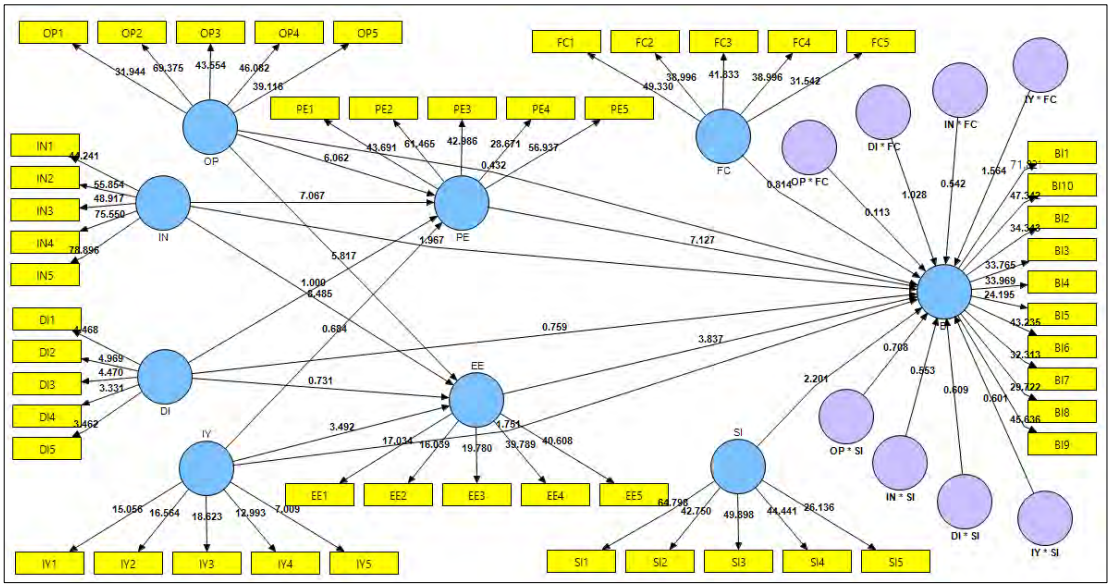


Figure 4. 9: Bootstrapping (Moderating Effect)

Note: Where, the 'OP' abbreviation refers optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'FC' abbreviation refers to facilitating conditions. EE = effort expectancy, PE = performance expectancy, PE = performance expectancy, SI = social influence, and BI = behavioural intention.

4.11 Hypothesis Testing

This study tested the hypotheses using the PLS-SEM. It is a statistical test to measure the relationship between an endogenous variable and exogenous variables. Bootstrapping is applied to measure the significance of path coefficients (Hair, Black, Babin, & Anderson, 2013). The number of bootstrap samples is suggested to be 5000, and the number of cases must be the same as the number of observations in the original sample. Besides that, critical t-values for a two-tailed test will be used to test the hypothesis where the value of 1.65 will be significant at a level of 10 percent (0.10), 1.96 at a level of significance of 5 percent (0.05), and 2.58 at a level of significance of 1 percent (0.01).

4.11 Findings Related to the Antecedents of Behavioural Intention

As noted in Table 4.22, there was a total of eight hypotheses tested to have relationship toward behavioural intention to use e-wallet transaction via QR code in this study. Out of the six hypotheses, four hypotheses were found supported. The results showed that behavioural intention was positive directly affected by optimism (β= 0.2012, t= 0.7355, p<0.01), innovativeness (β= 0.3893, t= 8.1600, p<0.01), performance expectancy (β= 3636, t= 6.9811, p<0.01) and effect expectancy (β= 0.266, t= 3.2209, p<0.01). Therefore, the results of the study do support the hypotheses of the study as postulated in H1a, H1b, H1e and H1f. However, discomfort (β= -0.0602, t= 1.0335, p<0.01) and insecurity (β= -0.0287, t= 0.7361, p<0.01) were found not supported, where H1c and H1d were not supported in this study.

Table 4. 22
Summary of Hypothesized Structural Relationship between the Antecedents of Behavioural Intention

Hypotheses	***Relationship***	***Full Model***			***Remarks***
		β	***S. E***	***T***	
H1a	OP → BI	0.2012	0.0539	3.7355***	Supported
H1b	IN → BI	0.3893	0.0477	8.1600***	Supported
H1c	DI → BI	-0.0602	0.0582	1.0335	Not Supported
H1d	IY → BI	-0.0287	0.039	0.7361	Not Supported
H1e	PE → BI	0.3636	0.0521	6.9811***	Supported
H1f	EE → BI	0.2266	0.0704	3.2209***	Supported

Note: * *Significant at p<0.10,* ** *Significant at p<0.05,* ****Significant at p<0.01.* Where, the 'OP' abbreviation refers optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'FC' abbreviation refers to facilitating conditions. EE = effort expectancy, PE = performance expectancy, SI = social influence, and BI = behavioural intention.

4.11.1 Findings Related to the Antecedents of Performance Expectancy

In Table 4.23, the results showed that performance expectancy was significant affected positively by optimism (β= 0.3761, t= 6.0746, p<0.01) and innovativeness (β= 0.4168, t= 7.2026, p<0.01). Therefore, H2a and H2b were supported. However, H2c was not supported in this study as the discomfort was found to have an insignificant

relationship toward performance expectancy (β= -0.0317, t= 0.7279, p<0.01). Besides that, insecurity was also found to has no relationship with performance expectancy (β= -0.0235, t= 0.6823, p<0.01). Thus, this result was not supported by the hypothesised relationship as postulated in H2d.

Table 4. 23
Summary of Hypothesized Structural Relationship between Antecedents of Performance Expectancy

Hypotheses	***Relationship***	***Full Model***			***Remarks***
		β	***S. E***	***T***	
H2a	OP → PE	0.3761	0.0619	6.0746***	Supported
H2b	IN → PE	0.4168	0.0579	7.2026***	Supported
H2c	DI → PE	-0.0317	0.0435	0.7279	Not Supported
H2d	IY → PE	-0.0235	0.0344	0.6823	Not Supported

Note: ** Significant at p<0.10, ** Significant at p<0.05, ***Significant at p<0.01.* Where the 'OP' abbreviation refers to optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'EE' abbreviation refers to effort expectancy.

4.11.2 Findings Related to the Antecedents of Effort Expectancy

In Table 4.24, the second hypothesis is the influence on effort expectancy. For these hypotheses, the result indicated that there is a positive impact of optimism (β= 0.3244, t= 5.8046, p<0.01) and innovativeness (β= 0.4154, t= 8.5994, p<0.01) on effort expectancy; therefore, H3a and H3b are supported. However, discomfort found to have an insignificant negative effect on the behavioural intention (β= -0.1381, t= 2.5203, p<0.01); thus, H3c also supported in this study. In additions, H3d was not supported in this study due to the insecurity was found to have no negative effect on behavioural intention (β= 0.1289, t= 3.4163).

Table 4. 24
Summary of Hypothesized Structural Relationship between Antecedents of Effort Expectancy

Hypotheses	***Relationship***	***Full Model***			***Remarks***
		β	***S. E***	***T***	
H3a	OP → EE	0.3244	0.0559	5.8046***	Supported
H3b	IN → EE	0.4154	0.0483	8.5994***	Supported
H3c	DI → EE	-0.0317	0.0435	0.7279	Not Supported
H3d	IY → EE	0.1289	0.0377	3.4163	Not Supported

Note: ** Significant at p<0.10, ** Significant at p<0.05, ***Significant at p<0.01.* , the 'OP' abbreviation refers to optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'FC' abbreviation refers to facilitating conditions.

4.11.3 The influence of Performance Expectancy and Effort Expectancy as Mediator

Result in Table 4.25 shows the mediation effect of performance expectancy on the relationship between four exogenous variables, namely optimism, innovativeness, discomfort and insecurity; and behavioural intention to use e-wallet transaction through QR code.

It is therefore clear from Table 4.25 that performance expectancy mediates the positive relationship between optimism and behavioural intention (β= 0.1367, t= 4.4407, p<0.01); and innovativeness and behavioural intention (β= 0.1515, t= 1.9184, p<0.05). Moreover, the VAF is more than 80 percent for H4a, while the VAF value is larger than 20 percent but smaller than 80 percent in H4b; thus performance expectancy was categorised as full mediation for the relationship between optimism and behavioural intention; and partial mediation for the relationship between innovativeness and behavioural intention. This concluded that H4a was fully supported and H4b was partially supported in this study. However, the result shows that performance expectancy does not mediate the relationship between discomfort and behavioural intention (β= -0.0157, t= 0.9379, p<0.01); and the relationship between insecurity and

behavioural intention (β= -0.0085, t= 0.6733, p<0.01). Therefore, H4c and H4d were not supported.

Besides that, the mediation effect of effort expectancy showed a significant relationship between optimism and behavioural intention (β= 0.0735, t= 2.5310, p<0.10), therefore, H4e was fully supported in this study as VAF is more than 80 percent in this study. Additionally, effort expectancy also mediates the relationship between innovativeness and behavioural intention (β= 0.0941, t= 3.4263, p<0.01); and insecurity and behavioural intention (β= -0.0292, t= 2.0487, p<0.10). Thus, H4f and H4g were partially supported in this study as VAF is in between 20 percent and 80 percent. However, the result in Table 4.25 shows that effort expectancy does not mediate the relationship between discomfort and behavioural intention (β= -0.0072, t= 0.4469, p<0.01). Therefore, H4f was not supported.

Table 4. 25
Summary of Hypothesized Structural Relationship of performance Expectancy and Effort Expectancy as a mediator

Hypotheses	***Relationship***	***Full Model***			***Remarks***
		β	***S. E***	***T***	
H4a	OP → PE → BI	0.1367	0.0308	4.4407***	Supported
H4b	IN → PE → BI	0.1515	0.0790	1.9184*	Partial Supported
H4c	DI → PE → BI	-0.0157	0.0167	0.9379	Not Supported
H4d	IY → PE → BI	-0.0085	0.0127	0.6733	Not Supported
H4e	OP → EE → BI	0.0735	0.0290	2.5310**	Supported
H4f	IN → EE → BI	0.0941	0.0275	3.4263***	Partial Supported
H4g	DI → EE → BI	-0.0072	0.0161	0.4469	Not Supported
H4h	IY → EE → BI	-0.0292	0.0143	2.0487**	Partial Supported

Note: ** Significant at p<0.10, ** Significant at p<0.05, ***Significant at p<0.01.* Where the 'OP' abbreviation refers to optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'FC' abbreviation refers to facilitating conditions. EE = effort expectancy, PE = performance expectancy, and BI = behavioural intention.

4.11.4 The influence of Facilitating Conditions and Social Influence as Moderator

Last, according to the hypothesis, it was predicted that facilitating conditions and social influence moderates the relationship between optimism, innovativeness, discomfort and insecurity towards behavioural intention to use e-wallet via QR code among M40 millennials in Malaysia. However, according to Table 4.26 below, the result from the statistical test shows that the facilitating conditions and social influence did not have a moderating effect on all the relationships as stated above. Thus, the hypothesis H5a, H5b, H5c, H5d, H5e, H5f, H5g and H5h were not supported in this study.

Table 4. 26
Summary of Hypothesized Structural Relationship of Facilitating Conditions and Social Influence as moderator

Hypotheses	***Relationship***	***Full Model***			***Remarks***
		β	***S. E***	***T***	
H5a	OP * FC → BI	0.0571	0.5052	0.113	Not Supported
H5b	IN * FC → BI	-0.2138	0.3944	0.5422	Not Supported
H5c	DI * FC → BI	0.251	0.2442	1.0283	Not Supported
H5d	IY * FC → BI	0.4399	0.2812	1.5643	Not Supported
H5e	OP * SI → BI	-0.2938	0.4147	0.7084	Not Supported
H5f	IN * SI → BI	-0.208	0.376	0.5532	Not Supported
H5g	DI * SI → BI	-0.1571	0.2579	0.6093	Not Supported
H5h	IY * SI → BI	-0.1664	0.277	0.6008	Not Supported

Note: ** Significant at p<0.10, ** Significant at p<0.05, ***Significant at p<0.01.* Where, the 'OP' abbreviation refers optimism. IN = innovativeness, DI = discomfort, IY = insecurity. The 'FC' abbreviation refers to facilitating conditions. EE = effort expectancy, PE = performance expectancy, and BI = behavioural intention.

4.12 The Summary of Hypotheses

There is a total of 30 hypothesised relationships are tested in this research. The results are found to support 10 of the hypotheses, 2 partially supported and the remaining 18 hypotheses were rejected. Table 4.27 summarises the results. In this study, the hypotheses of H1a, H1b, H1e, H1f, H2a, H2b, H3a, H3b, H4a, and H4e were supported. Meanwhile, H4b and H4f were partially supported. However, the hypotheses of H1c,

H1d, H2c, H2d, H3c, H3d, H4c, H4d, H4g, H4h, H5a, H5b, H5c, H5d, H5e, H5f, H5g and H5h were not supported in this study.

Table 4. 27
Summary of Hypotheses Testing

Hypothesis	Statement of Hypothesis	Remarks
H1a	Optimism has a positive effect on the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Supported
H1b	Innovativeness has a positive effect on the behavioural intention to e-wallet transaction via QR code among M40 millennials in Malaysia.	Supported
H1c	Discomfort has a negative effect on the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Not Supported
H1d	Insecurity has a negative effect on the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Not Supported
H1e	Performance Expectancy has a positive effect on the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Supported
H1f	Effort Expectancy has a positive effect on the behavioural intention to e-wallet transaction via QR code among M40 millennials in Malaysia.	Supported
H2a	Optimism has a positive effect on the performance expectancy of e-wallet transaction via QR code among M40 millennials in Malaysia.	Supported
H2b	Innovativeness has a positive effect on the performance expectancy e-wallet transaction via QR code among M40 millennials in Malaysia.	Supported
H2c	Discomfort has a negative effect on the performance expectancy e-wallet transaction via QR code among M40 millennials in Malaysia.	Not Supported
H2d	Insecurity has a negative effect on the performance expectancy of e-wallet transaction via QR code among M40 millennials in Malaysia.	Not Supported

H3a	Optimism has a positive effect on the effort expectancy of e-wallet transaction via QR code among M40 millennials in Malaysia.	Supported
H3b	Innovativeness has a positive effect on the effort expectancy of e-wallet transaction via QR code among M40 millennials in Malaysia.	Supported
H3c	Discomfort has a negative effect on the effort expectancy of e-wallet transaction via QR code among M40 millennials in Malaysia.	Not Supported
H3d	Insecurity has a negative effect on the effort expectancy of e-wallet transaction via QR code among M40 millennials in Malaysia.	Not Supported
H4a	Performance expectancy has a significant and positive mediating effect on the relationship between optimism and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Supported
H4b	Performance expectancy has a significant and positive mediating effect on the relationship between innovativeness and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Partially Supported
H4c	Performance expectancy has a significant and negative mediating effect on the relationship between discomfort and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Not Supported
H4d	Performance expectancy has a significant and negative mediating effect on the relationship between insecurity and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Not Supported
H4e	Effort expectancy has a significant and positive mediating effect on the relationship between optimism and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Supported
H4f	Effort expectancy has a significant and positive mediating effect on the relationship between innovativeness and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Partially Supported

H4g	Effort expectancy has a significant and negative mediating effect on the relationship between discomfort and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Not Supported
H4h	Effort expectancy has a significant and negative mediating effect on the relationship between insecurity and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Not Supported
H5a	Facilitating conditions moderates the relationship between optimism and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Not Supported
H5b	Facilitating conditions moderates the relationship between innovativeness and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Not Supported
H5c	Facilitating conditions moderates the relationship between discomfort and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Not Supported
H5d	Facilitating conditions moderates the relationship between insecurity and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Not Supported
H5e	Social influence moderates the relationship between optimism and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Not Supported
H5f	Social influence moderates the relationship between innovativeness and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Not Supported
H5g	Social influence moderates the relationship between discomfort and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Not Supported
H5h	Social influence moderates the relationship between insecurity and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.	Not Supported

4.13 Chapter Summary

This study uses the Partial Least Squares Structural Equation modelling (PLS-SEM) as the analysis approach. This chapter has comprehensively treated data analysis; from data collection and survey responses, response rate, demographic characteristic of the respondent, data screening and treatment, preliminary analysis, and descriptive analysis of the latent variable was performed. Before hypotheses testing, PLS-SEM path model was employed to assess measurement models (individual item reliability, internal consistency reliability, convergent validity and discriminant validity). The assessment of structural model in the form of structural model specification, significant path coefficient, assessment of effect size, predictive relevance, GoF, mediating effect and moderating effect were critically evaluated through PLS-SEM bootstrapping and blindfolding procedures. The detailed results of the hypotheses testing reflect a significant relationship between the investigated variables. Further explanation and discussion of the above results are provided in the next chapter.

CHAPTER FIVE

DISCUSSION AND CONCLUSION

5.1 Introduction

This chapter presents a discussion of the results obtained from the previous chapter. The first part of the chapter presents the overview of the study that includes the answer to the research question. Next, this chapter will describe the contributions that made in terms of the theoretical, managerial and methodological perspectives. Some recommendations for future research and the limitations of this study are provided as well. Lastly, this chapter ends with a conclusion.

5.2 Recapitulation of the Study

This section presents the recapitulation of the research findings based on the objectives of the research. The overall purpose of the present study is to investigate the critical determinants that influence the individual's behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. As this study aims to investigate the critical determinants that influence the individual's behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia, the determinants in UTAUT (Venkatesh *et al*., 2003) and TRI (Parasuraman, 2000a) were integrated. The achievement of the research objective would assist practitioners and academics researchers in understanding and in explaining the drives of e-wallet transaction via QR code among M40 millennials in Malaysia.

To recapitulate, the research objectives of this study are: (1) to investigate whether effort expectancy, performance expectancy, optimism, innovativeness, discomfort and insecurity that influence the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia; (2) to examine whether optimism, innovativeness, discomfort and insecurity influence the effort expectancy of e-wallet transaction via QR code among M40 millennials in Malaysia; (3) to investigate whether optimism, innovativeness, discomfort and insecurity influence the performance expectancy of e-wallet transaction via QR code among M40 millennials in Malaysia; (4) to investigate whether performance expectancy and effort expectancy mediates the relationship between optimism, innovativeness, discomfort, insecurity, and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia; and (5) to examine whether facilitating conditions and social influence moderate the relationship between optimism, innovativeness, discomfort, insecurity, and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.

To answer the research question and fulfil these objectives, a comprehensive literature review was conducted and incorporated throughout this study according to its relevance, particularly in Chapter Two which concentrate on the prior literature that relates to the topic. Literature review in Chapter Two demonstrated the UTAUT model, which brings together a variety of IT acceptance models that integrate the elements of eight well-known models. Also, TRI as the theory supported in this research, and the extant literature of relationships among the constructs in the theoretical framework of this study were discussed in Chapter Two as well. Research hypotheses are therefore being developed by referring to the research question and objective in chapter one. In

addition, the study contains a more comprehensive study of the model which plays a significant role in the research, performance expectancy was investigated as a mediator in this study.

Chapter three explains the data collection method employed in this study, where the self-administrated survey was distributed among M40 millennials in Malaysia. The research design of this study included the adoption of quantitative research and self-administrated questionnaire measurement. The questionnaire comprises 50 items for exogenous variables, endogenous variables, mediating variable, and 11 items for the demographic profile. The measurement instruments were confirmed by conducting a pilot study before actual data collection. The pilot study improves the measurements before the collection of actual data and assists in reformulating the ambiguous questions. Next, the primary data was collected, and from the total number of questionnaires distributed, 487 questionnaires were found to be usable, and proceed with further analysis.

The research hypotheses were tested by using SPSS 20 and SmartPLS 2.0 software. Then, the related result and data analysis are presented in Chapter Four. The analyses were initiated with survey response, the valid response rate, demographic profile, data screening and treatment, preliminary analysis, measurement model and structural model. Table 4.27 in Chapter Four represents the hypothetical outcome of Chapter Two of this study. The empirical results provide support for ten hypotheses (of H1a, H1b, H1e, H1f, H2a, H2b, H3a, H3b, H4a, and H4e) were supported. Meanwhile, two hypotheses (H4b and H4f) were partially supported. However, the hypotheses of H1c, H1d, H2c, H2d, H3c, H3d, H4c, H4d, H4g, H4h, H5a, H5b, H5c, H5d, H5e, H5f, H5g and H5h were not supported in this study.

5.3 Discussion

The results of data analysis have been discussed in the previous chapter. In this part, the discussion of the study focused on the research questions stated in Chapter One of this study. Research objectives answered research questions. In this section, the factors influencing the behavioural intention to use e-wallet transaction via QR code among millennials in Malaysia by the integration of UTAUT and TRI are discussed. Finally, an in-depth discussion pertains the mediation role of performance expectancy and effort expectancy, and the moderating role of facilitating conditions and social influence in bridging the will be discussed in the following section.

5.3.1 Findings Related to the Antecedents of Behavioural Intention

Behavioural intention was found to be directly affected by optimism ($\beta = 0.2012$, $p<0.01$), innovativeness ($\beta = 0.3893$, $p<0.01$). performance expectancy ($\beta = 0.3636$, $p<0.01$) and effort expectancy ($\beta = 0.2266$, $p<0.01$). Innovativeness factor was the most supported factor that influenced behavioural intention to use e-wallet transaction via QR code among M40 millennials followed by performance expectancy, effort expectancy and optimism, respectively. In detail, empirical evidence from this research shows that behavioural intention to use e-wallet transaction via QR code among M40 millennials was found to be affected by, optimism, innovativeness, performance expectancy and effort expectancy except for discomfort and insecurity. Thus, H1a, H1b, H1e and H1f were supported, while H1c and H1d were not supported.

First, optimism in this study has a significant and a positive effect on the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia; hence, the hypothesis H1a is supported. The result from this empirical study is consistent with other researcher's findings such as by Schaupp *et al*. (2010); Sinha *et*

al. (2018) which identified the positive relationship between optimism and behavioural intention, but it is contradictory to the result from other previous studies which is Rojas-Méndez *et al*. (2017). The result indicated that optimism among M40 millennials in Malaysia reflecting individual's positive beliefs about the behavioural intention to use e-wallet transaction via QR code to support practical activities. Optimistic people will intend to use new technology, and they will have a positive feeling about the particular technology, as in this case, e-wallet transaction via QR code. Also, optimistic will tend to have the behavioural intention to use the latest technology and believe greater use of technology can make them have better control over their own lives and thus work more efficiently.

Moreover, innovativeness seems to be an important predictor of behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. The result of this research indicated there is a significant and positive relationship between innovativeness and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. Therefore, H1b is supported. This result aligns with the result from a previous study (e.g. Escobar-Rodríguez & Carvajal-Trujillo, 2014; Martín & Herrero, 2012; Rojas-Méndez *et al*., 2017; Sinha *et al*., 2018; Thakur & Srivastava, 2014).

Agarwal and Prasad (1998) argued that individuals with higher personal innovativeness in IT are anticipated to build up more positive beliefs regarding technology. This result indicated that innovativeness of M40 millennials is an important factor to predict behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. In other words, the research finding indicates that M40 millennials in Malaysia have a high demand for innovation which

will lead to predicting behavioural intention to use e-wallet transaction via QR code. This study shows the participants might base on their innovative decisions to determine the behavioural intention to use e-wallet transaction via the QR code due to their curiosity and enthusiasm.

However, discomfort and insecurity were found to be insignificant predictors of and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. Therefore, hypotheses H1c and H1d were not supported. In fact, an individuals' behavioural intention to use e-wallet transaction via QR code becomes more negative when he or she feels the discomfort of e-wallet transaction via QR code is higher. In other words, the higher the feelings of technology discomfort among M40 millennials, the lower are their behavioural intention to use e-wallet transaction via QR code. For discomfort, the result of this study is not consistent with the findings of other previous studies (e.g. Rojas-Méndez *et al*., 2017; Sinha *et al*., 2018). This result indicated participants did not recognise that discomfort will influence their behavioural intention to use e-wallet transaction via QR code. As millennials are an affinity with the digital world (PwC, 2012a), and they never experience the world without IT (Akanbi *et al*., 2018), this enables them to master some skills of technology and apply it effectively (Cuong *et al*., 2015). Therefore, M40 millennials in Malaysia as respondents in this study feel comfortable with the cashless payment, namely e-wallet transaction via QR code.

In terms of insecurity, the empirical analysis in this study indicated an insignificant relationship between insecurity and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. Thus, H1h is not supported. This result is contradictory with other studies findings (e.g. Rojas-Méndez *et al*., 2017;

Sinha *et al*., 2018). Insecurity has a negative consequence of uncertainty in using the product or service, and it is one of the critical factors to be focused while financial institutions use to design and develop a banking service (Debasish & Dey, 2015; Faniran & Odumeru, 2015; Ismail & Masinge, 2011; Oluoch *et al*., 2015). However, insecurity issues were not seen by the M40 millennials as a major obstacle in the behavioural to use e-wallet transaction via QR code.

As the respondents in this study are M40 millennials, they might feel secured as they are technology savvy (Valentine & Powers, 2013). They might have the adequate technical knowledge and online experience to feel secured toward the e-wallet transaction via QR code. Besides that, M40 millennials might not have been exposed to the real risk situation. M40 millennials might feel confident and secured because they might have just seldom engaged in a huge amount of transactions. More or less, the purpose of using e-wallet is for online payment. Compare with the heaviest transaction users; the customer will always perform their transaction, whether on their personal or business activity, which involves a large transaction and huge balance in their account. Thus, for this type of customers, they might think security is one of the crucial issues that need to be improved from time to time by the financial institutions. Besides, the M40 millennials might have less information and alert on their insecurity. This implies that the management of financial institutions should address the individual's concern and provide assurances that their e-wallet transaction is safe and trustworthy.

Other than that, the finding from this empirical study shows that performance expectancy is significantly and positively influencing the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. Therefore, the

hypothesis H1e is supported. This result is consistent with the hypothesis of UTAUT (Venkatesh *et al*., 2003). In addition, the finding is in line with other researchers results found in previous studies such as Abrahão *et al*. (2016); Agustin and Mulyani (2018); Al-Queisi *et al*. (2014); Awwad and Al-Majali (2015); Cimperman *et al*. (2016); Escobar-Rodríguez and Carvajal-Trujillo (2014); Farah *et al*. (2018); Faria (2013); Gupta *et al*. (2019); Hoque and Sorwar (2017); Hsu *et al*. (2017); Khalilzadeh *et al*. (2017); Naranjo-Zolotov *et al*. (2018); Rahi and Ghani (2018); Rahi *et al*. (2018); and Raza *et al*. (2018). The result indicates that if e-wallet transaction via QR code improves the M40 millennials' performance, they will opt for these services.

According to the results, M40 millennials believe that performance of the e-wallet transaction via QR code evokes an intention to use this technology in real life. It appears that M40 millennials perceive the usefulness and the advantages of e-wallet transaction via QR code such as convenience, mobility, 24 hours' access anytime, anywhere and access without the limitations of the physical location. The study confirms that if the performance expectancy is high and positive, then the millennials among M40 are more likely to use the e-wallet transaction through QR code as it shows a positive and significant predictor of behavioural intention. Also, with the support of Tan and Lau (2016), this is because the positive performance expectations will lead to a positive perception of applications for prospective customers.

In fact, performance expectancy for personal performance is higher, and the user believes that e-wallet transaction via QR codes will have a greater contribution to their lives and activities than other banking alternatives. The nature of the ubiquitous e-wallet application provides users with an additional advantage over other banking channels because they provide immediate personal help; therefore, customers are more

likely to expect high results from the applications (Farah *et al*., 2018). Consequently, a consumer will use e-wallet transaction via QR code since the user sees it as a simple and useful tool for resolving banking transactions. Therefore, mobile operators and managers in the field should promote the advantages of using e-wallet transaction via QR code in terms of convenience and the ability to access services anytime and anywhere.

Generally, the study proved that as social beings, the behavioural intentions of M40 millennials of using e-wallet transaction via QR codes depends on the norms and values approved and acknowledged by the surrounding community. In addition, Malaysian culture may be a cause of great social impact, as collectivist countries prioritise and value the views of families and individual groups rather than their priorities and beliefs. Therefore, the subjective norms of the decision-maker should not be ignored, and if the subjective norms (environment or social connections) are in support of using technology, this decision will play a significant role in the decision process of adoption.

Last, empirical evidence from this study shows effort expectancy has a significantly positive effect on behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. Therefore, hypothesis H1f is supported. This finding is consistent with those of previous research which including the studies from Agustin and Mulyani (2018); Alaiad and Zhou (2013); Awwad and Al-Majali (2015); Cimperman *et al*. (2016); Escobar-Rodríguez and Carvajal-Trujill o(2014); Farah *et al*. (2018); Faria (2013); Gupta *et al*. (2019); Hoque and Sorwar (2017); Hsu *et al*. (20170; Khalilzadeh *et al*., 2017; Rahi and Ghani (2018); Rahi *et al*. (2018); Raza *et al*., 2018; Shaw and Sergueeva (2019). This indicates that if an individual in M40

millennials thinks that e-wallet transaction via QR code is easy to operate and does not require any instructions, it will create a behavioural intention to use e-wallet transaction via QR code for them.

This result highlights the fact that effort expectancy is a positive prediction of the behavioural intent of using e-wallet transaction through a QR code. The M40 millennials are continuously observing technologies that can promote their activities, and they need a little effort. When the M40 millennials thought the new technologies were easy to use, his probabilities of accepting the application increased dramatically. In fact, people around the world utilise their mobile devices expansively every day and rely heavily on them for most of the day. As a result, today's users are becoming proficient in mobile applications (Farah *et al*., 2018). Therefore, effort expectancy is measured as an important advantage of e-wallet application associated with other forms of banking, as users realise that such applications need less effort, highlight user-friendliness, and enable simple navigation inclusiveness.

5.3.2 Findings Related to the Antecedents of Performance Expectancy

In terms of factors affecting performance expectancy, performance expectancy was directly affected by optimism ($\beta = 0.3761$, $p<0.01$) and innovativeness ($\beta = 0.4168$, $p<0.01$) except discomfort and insecurity were not found significant. Therefore, H2a and H2b were supported; on the other hand, H2c and H2d were not supported in this study. Furthermore, innovativeness is the most influential predictors followed by optimism and effort expectancy, respectively.

Empirical evidence from this study reveals that optimism has significantly influence performance expectancy. Hence, H2a is supported. The empirical finding from this study indicated that the optimism construct is an important factor to performance expectancy of e-wallet transaction via QR code among M40 millennials in Malaysia. This finding reveals the M40 millennials in Malaysia significantly recognise the aspects of optimism. This result is consistent with the findings of other studies (Kuo *et al*., 2013; Pattansheti *et al*., 2016; Sinha *et al*., 2018). For M40 millennials, the optimistic technology that supports the use of technology is a chance to expand its area of expertise. If the e-wallet transaction via QR code is assimilated to the Millennium M40, they will benefit from a technological society. This shows that the optimistic M40 millennium is usually susceptible to receive technology performance for e-wallet transaction via QR code and believe that technology can make their work more efficient. That is, optimistic M40 millennials will expect the e-wallet transaction via the QR code can support with daily work and be more confident in using the e-wallet transaction via QR code.

In terms of the effect of innovativeness on performance expectancy, innovativeness is found to be significantly and positively affecting performance expectancy. Hence, H2b is supported. This means the performance expectancy of e-wallet in this study is shaped by the level of innovativeness among M40 millennials in Malaysia. This finding echo results from prior studies by Pattansheti *et al*. (2016); Sinha *et al*. (2018); and Thakur and Srivastava (2014), which found a significant relationship between innovativeness on performance expectancy. It can be concluded that M40 millennials in Malaysia with higher levels of innovativeness could be expected to develop positive opinions about the methods in terms of benefits and advantages (performance

expectancy) of the e-wallet transaction via QR code. Therefore, this study suggests that financial institutions should promote the benefits of e-wallet transaction via QR code in order to help the enthusiastic technology seekers to observe and generate a strong influence on performance expectancy or perceived usefulness of e-wallet.

On the other hand, the discomfort was found to be an insignificant predictor of performance expectancy. Therefore, H2c was not supported. This result is in line with other studies (Kuo *et al*., 2013) which found this relationship not supported. This may be due to of e-wallet transaction via QR code being viewed as a new technology in Malaysia and participants had no experience or knowledge yet with e-wallet transaction via QR code functionally in order to assess the benefits and the advantages of e-wallet. As cash is still the recent choice when paying for goods (Tan, 2018), this research suggests that financial institutions should promote the advantages and the usefulness of e-wallet for M40 millennials. In addition, designers of financial institutions should pay more kindness to user needs a study to govern their expectations and encounter the requirements of the e-wallet applications.

In terms of insecurity, the empirical analysis in this study indicated an insignificant relationship between insecurity and performance expectancy. Thus, H2d is not supported. The finding is consistent with other results from prior studies (Kuo *et al*., 2013; Pattansheti *et al*., 2016) which found no significant link between insecurity and performance expectancy. M40 millennials revealed that there is an insignificant relationship of insecurity toward the performance expectancy of e-wallet transaction via QR code. The insecurity characteristic of M40 millennials will not make them worry about being incapable of using e-wallet transaction via QR code gracefully. But still, financial institutions need to pay attention to the security performance of the e-

wallet. For example, the e-wallet mobile application necessity has a very secure password when conducting the transactions to safeguard the confidentiality and validity of the e-wallet transaction through the code of QR. Furthermore, if the user loses their phone, an emergency security service should be provided to block any e-wallet transaction immediately. In addition, the security system must be continually upgraded to certify trust in online transactions, as this will increase consumer confidence and trust level.

5.3.3 Findings Related to the Antecedents of Effort Expectancy

Effort expectancy was directly affected by optimism ($\beta = 0.3244$; $p<0.01$) and innovativeness ($\beta = 0.4154$; $p<0.01$) or H3a, and H3b were supported. Moreover, innovativeness is the most influential predictor, followed by optimism. However, discomfort and insecurity were found the insignificant predictors of effort expectancy. Therefore, hypotheses H3c and H3d were not supported in this study.

Empirical evidence from this study reveals that has optimism significantly influence effort expectancy. The H3a is supported, and the empirical findings are consistent with prior studies (e.g. Kuo *et al*., 2013; Pattansheti *et al*., 2016; Shin & Lee, 2014) base on TAM and UTAUT. The result is reflecting M40 millennials' positive beliefs about the ease of use of e-wallet transaction via QR code to support practical activities. This reveals that the more optimistic M40 millennials are, the more that perceived ease of use or effort expectancy toward e-wallet transaction via QR code. Optimism focuses on ownership of positive attitudes toward technologies such as people's confidence in control levels, flexibilities, conveniences and efficiencies (Kuo *et al*., 2013), while it is important that M40 millennials can assure that the technologies are easy to use and

under their control. In order to enhance optimism and thereby to make the M40 millennials to feel e-wallet transaction via QR code ease to use. It would be appropriate for the financial institution promoting e-wallet transaction via QR code to make e-wallet transaction via QR code experience exciting and mentally stimulating by designing the e-wallet transaction via QR code platform accordingly.

Empirical evidence from this study reveals that is a significant influence of innovativeness of M40 millennials on the effort expectancy of the e-wallet transaction via QR code in Malaysia. Thus, H3b is supported. This empirical finding is consistent with the prior study (e.g. Kuo *et al*., 2013; Pattansheti *et al*., 2016; Rahi & Ghani, 2018; Shin & Lee, 2014; Thakur & Srivastava, 2014; Zarmpou *et al*., 2012). M40 millennials treat mobile technology as easy to operate. This is because they prefer to explore new technology without any guidance. They learn on their own and become skilful in a short tenure. Therefore, the result indicated that M40 millennials who have the natural tendency to try new technology feel that e-wallet transaction via QR code is easy to use. In other words, the result shows M40 millennial with a higher level of innovativeness perceived that e-wallet transaction via QR code to be easy to use in Malaysia.

Besides, the results show that discomfort does not significantly affect the effort expectancy. Thus, hypothesis H3c is not supported. The result aligns with the result from previous studies (e.g. Pattansheti *et al*., 2016); however, the result is contradictory with other studies finding also (Kuo *et al*., 2013). In fact, the uncomfortable individual may be familiarised to use existing or simpler technology; they may consciously refuse to use high technology or new technology (Kuo *et al*., 2013). Conversely, the result implies that, if M40 millennial does not perceive e-wallet

transaction via QR code as discomfort, they will be more likely to perceive e-wallet transaction via QR code as being easy to use in Malaysia.

On the other side, in terms of the effect of insecurity on effort expectancy of e-wallet transaction via QR code, this research hypothesised there would be a negative and a significant relationship between insecurity and effort expectancy of e-wallet among M40 millennials in Malaysia. Evidence from this study shows that the relationship between insecurity and effort expectancy was not supported, and the result is in line with other researchers (e.g. Kuo *et al*., 2013; Pattansheti *et al*., 2016; Shin & Lee, 2014). Thus, H3d was rejected. This may be due to of e-wallet transaction via QR code being viewed as a new technology in Malaysia and participants among M40 millennials had no experience or knowledge yet with e-wallet transaction via QR code functionally. Also, the result implies that the expected understanding of e-wallet transaction via QR code will lower the resistance to the e-wallet transaction via QR code.

5.3.4 The influence of Performance Expectancy and Effort Expectancy as Mediator

This section examines the results of four hypotheses concerning the mediating effect of performance expectancy, and four hypotheses concerning the mediating effect of effect expectancy on the relationships between optimism, innovativeness, discomfort and insecurity towards behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. Empirical evidence from this study shows the effect of performance expectancy and effect expectancy have a full significant effect as a mediator between optimism and behavioural intention. Therefore, H4a and H4e were supported in this study. Besides that, performance expectancy and effect

expectancy have a significant partial effect as a mediator in between innovativeness and behavioural intention. Therefore, the result partially supports the hypothesis of the study as postulated in H4b and H4f. However, H4c, H4d, H4g and H6h were not supported in this study.

The mediating effect of performance expectancy and effect expectancy between optimism and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia was confirmed in this study. Therefore, the hypothesis of H4a and H4ewere supported. With the expectation, the findings of this study revealed the significant mediating effect of performance expectancy in the relationship between optimism and behavioural intention, and the significant mediating effect of effort expectancy in the relationship between optimism and behavioural intention. The result revealed a match between the characteristic of optimism and the behavioural intention that generate a positive impact. Without the mediator of performance expectancy and effort expectancy, optimism was found to have a positive influence on the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.

In the past studies, optimism was proved to have a positive influence on the behavioural intention to use technology in the several studies (Schaupp *et al*., 2010; Sinha *et al*., 2018). In Malaysia, there might be a piece of clear information that can direct M40 millennials to create a behavioural intention to use e-wallet transaction via QR code. They might have the understanding of technology potential and growth of experience also to get a positive impact on behavioural intention to use e-wallet transaction via QR code through performance expectancy. Therefore, the performance or usefulness and ease of use of e-wallet transaction via QR code must be emphasised

by financial institutions, especially among M40 millennials in Malaysia in order to increase the penetration rate of e-wallet adoption in Malaysia.

Next, the effect of performance expectancy and effect expectancy as a mediator between innovativeness and behavioural intention to use e-wallet transaction via QR code was examined in this study. The results of the mediating effect of performance expectancy and effect expectancy between innovativeness and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia was partially confirmed. Thus, H4b and H4f were partially supported. There is a direct impact between innovativeness and performance expectations, and between innovativeness and effort expectation, involving the presence of individual drivers of technology's behavioural intention to use. The innovative M40 millennials may be more confident in their technological capabilities and may trust that they are able easily to use these skills for e-wallet transaction through the context of QR codes. As Casey and Wilson-Evered (2012) explain, pioneering users are more likely to maintain good behaviour with new technologies; perhaps the innovative respondents in the studies more likely to recognise the performance of e-wallet transaction via QR codes through the availability in the context of performance expectancy mediation. Non-innovators with insufficient technical experience may try to imagine or predict how to use the technology.

In contrary to the expectations, the results of the study revealed the insignificant and no effect of the performance expectancy and effort expectancy in between discomfort and behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. Hence, H4c and H4g were not supported. This result reflects

the fact of absence of performance expectancy and effort expectancy when dealing with M40 millennials' discomfort.

In addition, it also reflects the opinion of M40 millennials when dealing with e-wallet transaction via QR code as individuals who are filled with the high level of discomfort may think that they lack technical knowledge, and as a result, they may feel frustrated towards a new technology (Kuo *et al*., 2013). Therefore, it seems that there is a lack of understanding and awareness among M40 millennials of the importance of performance usefulness and effort expectancy of e-wallet while having the intention to use e-wallet transaction via QR code. Discomfort M40 millennials might look at the e-wallet transaction via QR codes a new technology that cannot be done by themselves, and at the same time, they do not focus on the other perspective which is performance expectancy and effort expectancy that may lead to the positive behavioural intention to use e-wallet transaction via QR code.

Finally, this study had expected that performance expectancy and effort expectancy to fully mediate the effect of insecurity on behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. However, H4d and H4h were not supported as it states that performance expectancy and effort expectancy does not mediates insecurity and behavioural intention to use e-wallet transaction via QR code.

In fact, when an individual perceived e-wallet transaction via QR code platform to be insecurity in achieving their daily objectives, they tend to develop the performance expectancy and effort expectancy negatively and which eventually leads to negative behavioural intention to use e-wallet transaction via QR code. But for this study, the

findings seem to suggest that the M40 millennials for this study do not regard performance expectancy and effort expectancy as another important factor that makes them have behavioural intention to use e-wallet transaction via QR code. This result perhaps was obtained from M40 millennials as technology savvy as they might be heavy users of other technology product, service or system, they must have acquired the knowledge or ability to predict the negative outcomes or attributes for a closely related product, service or system (Sinha *et al*., 2018). Therefore, this study emphasises that technology and human-based delivery channels are closely related to how customers are providing these banking services to them and that the perceived perception of trust in the virtual environment can be determined to control the behavioural intent of using e-wallet transaction through QR code.

5.3.5 The influence of Facilitating Conditions and Social Influence as moderator

The last objective of this study was the moderating effect of facilitating conditions and social influence on the relationship between optimism, innovativeness, discomfort and insecurity towards behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia, led to formation of 8 hypotheses, which was formulated and tested using the PLS path modelling. The result of this study showed that the role of facilitating conditions and social influence as moderating variables on the relationships could not be established. Therefore, the empirical results did not support these hypotheses, namely H5a, H5b, H5c, H5d, H5e, H5f, H5g and H5h.

Facilitating conditions is the extent to which people believe that an organisational and technical infrastructure exists to support the use of e-wallet transaction via QR code. To use e-wallet transaction via QR code, an individual requires skills, knowledge, experience, mobile phone, internet connection, and security (Baptista & Oliveira, 2015;

Raza *et al*., 2018). The better the facilitating conditions are available to the user; the more will be their willingness to accept the technology. In other terms, M40 millennials did not view the availability of resources, the availability of knowledge and the presence of facilitating conditions as an essential requirement to use e-wallet transaction via QR code in Malaysia.

On the other side, social influence factor is important to improve the behavioural intention to use technology Abrahão *et al*. (2016); Agustin and Mulyani (2018); Akhtar *et al*. (2019); Alaiad and Zhou (2013); Awwad and Al-Majali (2015); Escobar-Rodríguez and Carvajal-Trujillo (2014); Farah *et al*. (2018); Gupta *et al*. (2019); Hoque and Sorwar (2017); Hsu *et al*. (2017); Isaias *et al*. (2017); Khalilzadeh *et al*. (2017); Njenga and Salih (2019); Olaleye and Sanusi (2019); Pattansheti *et al*. (2016); Rahi *et al*. (2018); Salloum (2019); Tan and Lau (2016); Tarhini *et al*. (2016); and Zuiderwijk *et al*. (2015). Studies have shown that individuals are more likely to accept new technologies in their lives when the technology is recommended and supported by important others (Farah *et al*., 2018; Sekyere Mbrokoh, 2016). In addition, individuals can use new products or services that are proposed and used by internal leaders within their internal circle of opinion. Remarkably but controversially, the rapid growth of social media and online community platforms gives individuals the power to refer to online reviews and testimonies before applying certain applications (Farah *et al*., 2018).

However, in this study, the possible reason why the moderating effect of facilitating conditions and social influence was insignificant against the relationship between optimism, innovativeness, discomfort and insecurity towards behavioural intention was due to different facilitating conditions and social influence that are faced by the

M40 millennials in Malaysia. Although the study was conducted in the of e-wallet, however, encompasses several technologies, such as mobile banking, online shopping, and so on. The diversity of non- e-wallet users covered in this study might be a possible reason why there is an insignificant relationship. For example, government policies in the e-wallet and mobile banking might be quite different, as well as the terms of performance of the technology.

Within this study, the measurement of facilitating conditions and social influence which is inspired by Baptista and Oliveira (2015) conducted research on mobile banking. Their research was conducted based on the cultural moderator. Thus, the kind of sample might contribute to the different result of this study with the previous study. In addition, the different locations of the study would be able to make a different result of the study (Foo-Wah *et al*., 2019; Lim *et al*., 2018). Besides that, despite Baptista and Oliveira (2015) revealed that cultural moderators would influence the decision of an individual behavioural intention to technology, but most of the previous studies were conducted in the developed countries. However, this study was conducted in Malaysia, which considers as a developing country, this might have different types of facilitating conditions and social influence.

5.4 Contribution of the Study

The study shows that in countries like Malaysia that are rapidly introducing new technology, the overall belief in technology affects certain technological concepts. In this case, e-wallet transaction via QR code. In the present study, the findings of this study have several contributions to theory, methodology and practice in the context of e-wallet transaction via QR code among M40 millennials in Malaysia. The following sub-sections discuss each contribution.

5.4.1 Theoretical Contribution

From a theoretical standpoint, this research has several contributions to the existing body of literature. First, to the best of researcher's knowledge, this is an early attempt toward a holistic and integrative approach to explaining the behavioural intention to use e-wallet transaction via QR code. Although prior studies have addressed behavioural intention to use any another type of technologies, however, the strength of this research lies in combining the technology readiness and adoption readiness determinants from two established technology models, namely UTAUT and TRI. This is evidenced by the high explanatory power of the research model. This e-wallet transaction via QR code acceptance model explains 34.12 percent of the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. Therefore, the research models are thus a valuable contribution to the existing body of research as it has occupied enough prediction power for prediction purposes.

Second, it is important to point out that the constructs relevant to the behavioural intention to use e-wallet transaction via QR code are not just the determinants from UTAUT (including facilitating conditions, effort expectancy, performance expectancy and social influence), but also determinants from TRI (including optimism and innovativeness). This warrants the development of a conceptual model that integrates UTAUT and TRI to explain the behavioural intention to use new technology such as e-wallet.

Precisely, as the overall model is significant, thereby, this study contributed to the previous study theoretically through the empirical evidence in the determinants in UTAUT and TRI toward the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. This study has 30 hypotheses, 10

hypotheses are supported, 2 partially supported while 18 are not. The study adds further knowledge on the importance of effort expectancy, performance expectancy, optimism and innovativeness in predicting the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. Specifically, the positive linkage between the predictors has proved that it is an important determinant to predict the behavioural intention to use e-wallet transaction via QR code.

Also, the results provide additional empirical support for the research framework and contribute to expanding the literature in the behavioural intention to use new technology. For instance, the linkage between the determinants in TRI and the determinants in UTAUT has also been investigated in this study. The results indicated that optimism and innovativeness were found to have a significant positive relationship with effort expectancy. Besides that, optimism and innovativeness were also found to have a significant positive relationship towards the performance expectancy e-wallet transaction via QR code among M40 millennials in Malaysia. The significant antecedents reported in this study might be investigated by other technologies context.

Next, to address the gap, this study contributes knowledge through the investigation of the direct and indirect relationships between these variables. Little or no attention has been given to the mediation role of performance expectancy and effort expectancy in explaining how TR and behavioural intention to use technology relationship exists. Thus, the study emphasises an often neglected, yet profound, tie between behavioural intention to use theory and technology readiness literature. In fact, performance expectancy and effect expectancy which acts as a mediator for the relationship between determinants in TRI and behavioural intention to use e-wallet transaction via QR code can be measured as the original contribution to this study. In this respect, the outcome

of this study contributes to the literature in the performance expectancy and effect expectancy significantly directly to the behavioural intention to use e-wallet transaction via QR code. In this study, there is a full mediation effect of performance expectancy and effect expectancy on the relationship between optimism and behavioural intention. However, this study indicated a partial mediating effect of the performance expectancy through the innovativeness on the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia.

Besides that, there is a partial mediating effect of the effort expectancy through the innovativeness on the behavioural intention as well. This means that, in order to increase the degree of behavioural intention to use an e-wallet, financial institutions need to increase the performance expectancy and effort expectancy of e-wallet. Hence, this research suggests that financial institutions may need to obtain better performance expectancy and effort expectancy of e-wallet to increase the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. Nevertheless, there is no moderating effort of facilitating conditions and social influence towards the relationship between optimism, innovativeness, discomfort and insecurity on behavioural intention. This added new knowledge for future studies.

In the past literature, there are almost no researches focus on the M40 group in Malaysia, and there are few empirical kinds of research focus on millennials (Leon, 2018; Tan & Lau, 2016; U & C, 2016). In addition, past studies do not have a comprehensive knowledge of this M40 millennial in Malaysia. Therefore, this study can be the first study to empirically test the determinants of the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. Consequently, this study contributes to the M40 millennials in Malaysia by providing

empirical evidence to support the behavioural intention to use e-wallet transaction via QR code.

Moreover, a review of past literature on behavioural intention showed that most of the studies have been conducted in other context such as WeChat mobile payment innovation (Larasati *et al*., 2018), e-invoicing (Olaleye & Sanusi, 2019), sport smart wearable devices (Seol *et al*., 2017), e-learning system (Salloum, 2019), home telehealth services (Cimperman *et al*., 2016), online tickets (Escobar-Rodríguez & Carvajal-Trujillo, 2014), mobile health (R. Hoque & Sorwar, 2017), e-book (Hsu *et al*., 2017), NFC (Khalilzadeh *et al*., 2017), mobile payment (Teo *et al*., 2015), internet banking (Rahi *et al*., 2018; Tarhini *et al*., 2016), mobile banking (Akhtar *et al*., 2019; Foo-Wah *et al*., 2019; Siyal *et al*., 2019; Teo *et al*., 2015), online shopping (Bilgihan, 2016), m-learning (Thongsri *et al*., 2018), entrepreneurial (Lim *et al*., 2017), fashion (Hur *et al*., 2017), and even note taking and photo sharing (Ding & Chai, 2015), and past studies have recommended focussing on another technology context.

Also, most of the past studies have been conducted in developed nations such as the UK and the US, Western Asia such as Iraq and Jordan, and East Asia, such as China and Taiwan. Not many studies have been conducted in South East Asia such as Malaysia. Therefore, by conducting this study in Malaysia, it is expected that it will improve the understanding of the behavioural intention to use e-wallet transaction via QR code in South East Asia and other developing countries.

5.4.2 Managerial Contribution

This study also presents practical insights into the banking industry. The findings of this study are especially valuable for financial institutions, as the current study

examined the influence of the behavioural intention to use e-wallet transaction via QR code among M40 millennials. Thus, this study relates to the financial institutions about the behavioural intention of e-wallet among M40 millennials in Malaysia which could spark interest and actions among them. The results of this study provide the understanding of the factors in driving the behavioural intention to use e-wallet transaction via QR code.

The relatively low usage level of e-wallet has provided insight and shed light on potential avenues of developing the action plan for promoting the products or services towards increasing the usage level. It also offers a vast opportunity for financial institutions to increase the M40 millennials' awareness and knowledge about e-wallet, especially QR code which affects their usage level. Thus, financial institutions should use the results from this study in order to increase the behavioural intention to use e-wallet transaction via QR code especially among M40 millennials in Malaysia. This is because it offers great opportunities for financial institutions to understand deeper the reason for the future potential users which are group M40 millennials' behavioural intention to use the e-wallet transaction via QR code.

Additionally, the banking industry in Malaysia can use this study to have a better understanding of the behavioural intention to use e-wallet among M40 millennials. The findings of this study declare that M40 millennials' behavioural intention to use e-wallet transaction via QR code is positively influenced by the effort expectancy, performance expectancy, optimism, and innovativeness. M40 millennials is a good market segment since they are active users of mobile technology devices. To achieve that, financial institutions need to emphasise on the benefit, including the ease of use and the usefulness of e-wallet services for M40 millennials.

Also, financial institutions need to keep informing and educating consumers and increase the product's awareness continuously. Additionally, financial institutions need to show up the compatibilities of the e-wallet transaction via QR code with the individuals' lifestyles and values as well as fulfilling their current needs. To build a positive behavioural intention, marketers need to persuade and convince the M40 millennials that using the mobile phone in order to meet consumers' interest and fit well with their lifestyles. Also, support services should always be available, and the financial institutions need to continuously promote that e-wallet can be used hassle-free and can be easily accessed. Financial institutions can strive to improve the consumer's levels of confidence where the simple guideline, providing useful information, provide support service and generate positive word-of-mouth regarding the e-wallet usage and equip them with appropriate knowledge of using e-wallet transaction via QR code.

Besides, Venkatesh, Davis and Morris (2007) emphasised that high results of TRs create a sense of self-efficacy by considering the use of technology and greater control over technology-related tasks to better understand the use and ease of use of technology (Gefen *et al*., 2003). In addition, according to Sinha *et al*. (2018), a high TR will raise the confidence level and openness to suggestions for others who are important to adopting the technology.

Thus, in building the customers' technology readiness or self-confidence, financial institutions might consider developing positive word-of-mouth and the positive remark from these reference groups. In their perception of availability of the resources, financial institutions need to demonstrate the convenience of using the e-wallet, for example, the scan for a QR code for any transaction can be completed at any time and

anywhere. Besides, financial institutions need continuously providing them with knowledge and information which might help them to increase their perception about resources, the performance and ease of use of the e-wallet among for M40 millennials as discussed above. Last, financial institutions also need to focus on implementing risk reduction or uncertainty reducing strategies in increasing the M40 millennials' intention to use e-wallet transaction via QR code.

As Malaysia was chosen area for the present study, thus, the findings of this study also contribute to upper-middle-income countries or developing countries. Accordingly, the findings of the present study were important to Malaysia to increase the penetration rate of e-wallet. In addition, the findings of the present study provided useful suggestions and directions for the government and financial institutions to understand better the determinants in driving the behavioural intention to use e-wallet transaction via QR code. More broadly, Malaysian technology providers will be attentive in countries with low levels of electronic readiness and advise them to give more attention to strategic communication with the target market. For example, the advertising strategies in a country with a high insecurity score in TRI will require attention more on reducing uncertainty, while in a highly optimistic environment, the potential benefits of new technology devices or services will be emphasised.

5.4.3 Methodological Contribution

Besides the theoretical and managerial contributions, this study puts forth some other methodological contributions. Firstly, this could be the first study that has adapted the measurement instruments from various context, which were empirically tested by Habbal, (2017), Faaeq *et al*., (2017) and Rojas-Méndez, Parasuraman, and Papadopoulos, (2017), in order to investigate the determinants that influence the

behavioural intention to use e-wallet via QR code transactions among M40 millennials in Malaysia. Indeed, the present study has contributed to the methodological perspective by empirically establishing their reliability and validity of the measurement instruments in the Malaysia business environment. Thus, the present study has significantly contributed to the methodological perspective.

Through the present study, it provides a methodological contribution to the scholarly discussion of UTAUT and TRI. The integration towards both of this the model values the need for empirical evidence presented in the literature of the relationship about these models. The research model in this study contributed to the previous study through the empirical evidence among M40 millennials in Malaysia. Hence, the current study represents a further contribution to methodology and literature of e-wallet transaction via QR code by establishing the validity and reliability of the adapted measures in the Malaysia context.

Moreover, previous studies on the e-commerce including e-wallet, mobile payment, and mobile banking have mainly used SPSS and AMOS, but to the best knowledge of the researcher, very few have used SmartPLS-SEM 2.0 to produce results. Thus, the application of PLS-SEM analysis in this study has also measured a type of methodological contribution. This is because PLS-SEM analysis can improve quality and provide valuable research capabilities and more precise results. Moreover, to date, only a few previous studies have used PLS-SEM analysis to test these hypotheses. The use of PLS-SEM to determine the reflective latent variables in this has contributed to the methodology perspective. To this end, latent constructs' Cronbach's Alpha reliability, AVE, factor loading, composite reliability, discriminant validity, Q^2 value, f^2 value, q^2 value, and GoF were all found to meet the recommended threshold.

Consequently, this study has applied the reliable method of PLS-SEM successfully to review the psychometric properties of the latent constructs described in the study research, and the assessment of the predictive power of the model has explored the relationship between all constructs in a validated context.

5.5 Limitation of the Study

Even though this study provides good insights and several contributions; there are still some limitations that should be considered when discussing the results of the study. Several limitations are discussed in this study based on previous chapters. First, this research is based on the two models, namely, UTAUT and TRI. The potential limitation of this study is related to the measures of the constructs used in this research framework. This study examined the relationship of the determinants in UTAUT (including facilitating conditions, effort expectancy, performance expectancy and social influence) and determinants in TRI (including optimism, innovativeness, discomfort and insecurity) toward the behavioural intention to use e-wallet transaction via QR code. Additionally, only the relationship of the predictors in TRI toward effort expectancy and performance expectancy was investigated. Also, this study only tested the mediating effect of the performance expectancy and effort expectancy on the relationship between optimism, innovativeness, discomfort and insecurity; and behavioural intention to use e-wallet transaction via QR code.

Secondly, in Chapter Four, the R-square of the behavioural intention to use e-wallet transaction via QR code was 57.31 percent. This means that the research model's variables contribute to 57.31 percent of behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. Based on this result, it

can be concluded that some other variables may increase the percentage of behavioural intention to use technology which can be considered for future study.

Thirdly, the sample in this study comes from M40 millennials in Malaysia. The employment of M40 millennials limits the conclusion and discussion of the findings. Also, the generalizability is affected by the geographic and industry. In detail, the empirical evidence of this study is collected within M40 millennials within Malaysia, and the results may not be generalised and inapplicable to other countries. Since this study has limited itself in Malaysia, thus; as a result, generalisation of the finding to other generation cohort and other countries in order to examine the different behavioural intention to use technology.

Next, in the methodology part, the current study is correlational research that conducted in a cross-sectional research setting in which the opinions of respondents were captured at one specific point in time to examine the hypothesised relationships. The reason for using the cross-section design in this study is that it requires less time and lower cost and less effort than the longitudinal design. Thus, due to the cross-sectional nature of this study, it is limited in proving causal relationships between the variables (Sekaran & Bougie, 2013). Last, as an example of a quantitative research approach, respondents were asked to transmit their views based on statements in the questionnaire into numbers through the 7-Likert scale. These answers may be affected by biases in the situation (Macinati, 2008).

5.6 Recommendation for Future Research

Due to the chosen design and research background, this study has some limitations, which is the basis for further research. Thereby, this study provided lots of future research opportunities based on the limitations that had discussed in the above section.

First, based on the limitation discussed above, this research was only based on the two technology models, namely, UTAUT and TRI. A future study could integrate another theoretical model such as the Initial Trust Model and Task-Technology Fit model in order to increase the explanatory power of technology acceptance research. On top of that, further studies are also recommended to re-examine these variables to strengthen the results as it contributes to academics as well for the literature review.

Second, as some other variables may increase the degree of behavioural intention to use e-wallet transaction via QR code, therefore, future researchers could further broaden the scope of this study and include the other predictors which have not taken into consideration in this study such as perceived risk, initial trust, perceived enjoyment, reputation, perceived cost and perceived benefit. Moreover, performance expectancy and effort expectancy are also recommended to be used as a mediating role in the future study. Additionally, the moderating effect of facilitating conditions and social influence were also suggested to be re-examined in the future study. On the other hand, future researches are recommended to examine the moderating role of consumer demographics such as gender and level of education among M40 millennials in the relationship between optimism, innovativeness, discomfort, insecurity, facilitating conditions, performance expectancy, effort expectancy and social influence; and behavioural intention to use e-wallet transaction via QR code.

Third, future studies can be conducted by examining the same model in a different technological context. This model can also be examined empirically using data collected from other countries in the region that have strong and unique cultural practices. Malaysia cultural differences might be explained to these differences results and findings. Thus, a comparative study between different countries could be interesting to carry out as the results may not be generalizable to other national contexts. Moreover, this study has only focused on the M40 millennials. In future studies, this phenomenon should be examined in other income groups which including T20 and B40. Other than that, another generation cohort is recommended to be investigated in future.

Next, as the data was collected at one time, this might not permit the data to represent long-term behaviours of the M40 millennials. Because of these limitations, a longitudinal study is suggested for future research. Moreover, to examine the causal relationships between the endogenous and exogenous variables, a longitudinal study should be a better choice. The longitudinal method will take a longer period to verify the same variables that have investigated in this study, as the predictors toward behavioural intention to use e-wallet transaction via QR code might change over time in most cases. Longitudinal research approach can explain long period complex relationships. Longitudinal research can better explain the development of variables over time and to detect changes in the relationship between variables through the process. In term of collecting time-series, data method will give investigators a better understanding of the causality of relationship and validate the findings from cross-sectional studies.

Last, as one of the limitations in this study employing quantitative research methods; thus, this study suggests that the design of future research would reflect mixed research designs. On the other hand, research design, either quantitative or qualitative will be used for future research to counterpart with each other. Also, future studies can use different measurement scales in Likert scale such as a five-point and eleven points Likert scale by adopting the measurement items in this study.

5.7 Conclusion

In short, the fourth industrial revolution which also known as Industry 4.0, is a response to the revolution of an industry that will change the way people live, work and interrelate each other, counting with the way people use and utilise greatly disruptive artificial intelligence, robotics and blockchain technologies. Furthermore, Malaysia is increasingly developing key economic initiatives in all economic segments in driving the country towards becoming a high-income industrialised country by the year 2020. This impression is visible in the financial institution where technology is a significant driver for the economy. Making payments is part of consumers' everyday lives. Over the past few decades, businesses organisations have persistently invested heavily in the implementation of new IT in order to achieve their competitive advantage. More recently, an increased stream of research has special pay attention to the determinants that are considered significant by end-customers when they have the intention to accept new IT-enabled channels. In this regard, information systems (IS) related research are diverted to the latest development of the IS field, named electronic wallet or e-wallet.

Besides that, mobile phones can be used as virtual bank cards, automated teller machines (ATMs), a terminal of point of sales and internet banking terminals to

provide instant access to accounts and allow remote transmission. Also, with the rapid development of technology, and the ever-changing population and the lifestyle of people, the traditional banking channel is to give way to the electronic banking or e-banking channel and more recently to the channel of e-wallet. This situation needs to pay attention because IS specialists describe it as one of the most promising and most vital developments in the mobile commerce and banking sectors due to the intense convergence of the internet, wireless technologies and mobile devices.

Through the proliferation of mobile technology and widespread connectivity, consumers can opt for the novelty and convenience of e-wallet. Moreover, recent IS studies have proposed to focus on combining the determinants in different theoretical models to predict IT acceptance, indicating that a broad view is needed in this context. Thus, this research investigated the state of the art of e-wallet utilisation via QR code, where this is an empirical study on relevant predictors among M40 millennials in Malaysia. Furthermore, this study determines the influencing factors that are contributing to the behavioural intention to use e-wallet transaction via QR code in Malaysia. This study integrated the elements in the frameworks of UTAUT and TRI fully to explore the behavioural intentions to use e-wallet transaction via QR code among M40 millennials in Malaysia.

Based on the research question and the discussion in earlier sections, this study attempts to understand the importance and the relationship between determinants in consumer's general beliefs by using TRI, which including optimism, innovativeness, insecurity and discomfort; and the individual's perception toward the behavioural intention by using the UTAUT, which including facilitating condition, performance expectancy, effort expectancy and social influence. Also, the present study has sought

to investigate the mediating effect of performance expectancy and effort expectancy on the relationships between optimism, innovativeness, discomfort and insecurity towards behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. Besides that, the moderating effect of facilitating conditions and social influence has also been investigated on the relationship between optimism, innovativeness, discomfort and insecurity towards behavioural intention to use e-wallet transaction via QR code.

Having analysed the results, the proposed framework had provided insight into the relationship between each variable that influences the behavioural intention to use e-wallet transaction via QR code in Malaysia. Base on the findings in this study, behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia was positively influenced by effort expectancy, performance expectancy, optimism and innovativeness. Moreover, effort expectancy of e-wallet transaction via QR code was positively influenced by optimism and innovativeness. Furthermore, performance expectancy of e-wallet transaction via QR code was positively influenced by optimism and innovativeness.

Besides that, performance expectancy and effort expectancy as a mediator has a significant partial effect between innovativeness and behavioural intention in this study. Furthermore, the full mediation effect of performance expectancy and effort expectancy between optimism and behavioural intention to use e-wallet transaction via QR code. However, there is no significant moderating effect of facilitating conditions and social influence between optimism, innovativeness, discomfort and insecurity towards behavioural intention to use e-wallet transaction via QR code in this study.

As a result, the current attempt has filled the existing gap in the behavioural intention to use e-wallet transaction via QR code among M40 millennials in Malaysia. However, based on the limitations of the study, several directions for future research are outlined. In this case, further studies are needed to confirm those relationships and to incorporate other variables that may affect the result. Thus, further empirical research in this area is broad in the future.

REFERENCES

A., V., C, S., A., V., & C, S. (2012). Mobile Banking –An Overview. *Advances In Management*, *5*(10). Retrieved from https://econpapers.repec.org/article/mgnjournl/v_3a5_3ay_3a2012_3ai_3a10_3aa_3a4.htm

A.T. Kearney. Inc. (2013). Banking in a Digital World. In *AT Kearney*. Retrieved from http://www.atkearney.de/financial-institutions/ideas-insights/featured-article/-/asset_publisher/4rTTGHNzeaaK/content/banking-in-a-digital-world

Abadi, H. R. D., Ranjbarian, B., & Zade, F. K. (2012). Investigate the Customers' Behavioral Intention to Use Mobile Banking Based on TPB, TAM and Perceived Risk (A Case Study in Meli Bank). *International Journal of Academic Research in Business and Social Sciences*, *2*(10), 312–322.

Aboelmaged, M. G., & Gebba, T. R. (2013). Mobile Banking Adoption : An Examination of Technology Acceptance Model and Theory of Planned Behavior. *International Journal of Business Research and Development*, *2*(1), 35–50.

Abrahão, R. de S., Moriguchi, S. N., & Andrade, D. F. (2016). Intention of adoption of mobile payment: An analysis in the light of the Unified Theory of Acceptance and Use of Technology (UTAUT). *RAI Revista de Administração e Inovação*. https://doi.org/10.1016/j.rai.2016.06.003

Accenture. (2016). *The Edge of a New Frontier*. Accenture.

Aderonke, A., & Ayo, C. K. (2010). An Empirical Investigation of the Level of Users' Acceptance of E-Banking in Nigeria. *Journal of Internet Banking and Commerce*, *15*(1), 1–13.

Afshan, S., & Sharif, A. (2016). Acceptance of mobile banking framework in Pakistan. *Telematics and Informatics*, *33*(2), 370–387. https://doi.org/10.1016/j.tele.2015.09.005

Agarwal, R., & Prasad, J. (1998). A Conceptual and Operational Definition of Personal Innovativeness in the Domain of Information Technology. *Information Systems Research*, *9*(2), 204–215. https://doi.org/10.1287/isre.9.2.204

Agustin, H., & Mulyani, E. (2018). The Acceptance and Use of E-Learning System Among Accounting Lecturers in State and Private Universities in Padang: An Empirical Study Based on UTAUT Model. *Proceedings of the First Padang International Conference On Economics Education, Economics, Business and Management, Accounting and Entrepreneurship (PICEEBA 2018)*, *57*(Piceeba), 6–13. https://doi.org/10.2991/piceeba-18.2018.72

Ahire, S. L., Golhar, D. Y., & Waller, M. A. (1996). Development and Validation of TQM Implementation Constructs. *Decision Sciences*, *27*(1), 23–56. https://doi.org/10.1111/j.1540-5915.1996.tb00842.x

Ajzen, I. (1985). From Intentions to Actions: A Theory of Planned Behavior. In *Action Control* (pp. 11–39). https://doi.org/10.1007/978-3-642-69746-3_2

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Ajzen, I. (2001). Nature and Operation of Attitudes. *Annual Review of Psychology*, *52*(1), 27–58. https://doi.org/10.1146/annurev.psych.52.1.27

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Prentice-Hall.

Akanbi, M. L., Sulaiman, K. A., & Adeyemi, I. O. (2018). Psychosocial Consequences of Intensive Internet Use among Undergraduates of Universities in Ilorin Metropolis. *Library Philosophy and Practice*, 1–23.

Akhlaq, A., & Ahmed, E. (2013). The effect of motivation on trust in the acceptance of internet banking in a low income country. *International Journal of Bank Marketing*, *31*(2), 115–125. https://doi.org/10.1108/02652321311298690

Akhtar, S., Irfan, M., Sarwar, A., Asma, & Rashid, Q. U. A. (2019). Factors influencing individuals' intention to adopt mobile banking in China and Pakistan: The moderating role of cultural values. *Journal of Public Affairs*, (September 2018), e1884. https://doi.org/10.1002/pa.1884

Akturan, U., & Tezcan, N. (2012). Mobile banking adoption of the youth market: Perceptions and intentions. *Marketing Intelligence & Planning*, *30*(4), 444–459. https://doi.org/10.1108/02634501211231928

Al-Jabri, I. M., & Roztocki, N. (2015). Adoption of ERP systems: Does information transparency matter? *Telematics and Informatics*, *32*(2), 300–310. https://doi.org/10.1016/j.tele.2014.09.005

Al-Jabri, I. M., & Sohail, M. S. (2012). Mobile banking adoption: application of diffusion of innovation theory. *Journal of Electronic Commerce Research*, *13*(4), 379–391.

Al-Queisi, K., Dennis, C., Alamanos, E., & Jayawardhena, C. (2014). Website design quality and usage behavior: Unified Theory of Acceptance and Use of Technology. *Journal of Business Research*, *67*(11), 2282–2290. https://doi.org/10.1016/j.jbusres.2014.06.013.The

Alaiad, A., & Zhou, L. (2013). Patients' Behavioral Intention toward Using Healthcare Robots. *Americas Conference on Information Systems*, 1–11.

Alalwan, A. A., Dwivedi, Y. K., & Rana, N. P. (2017). Factors influencing adoption of mobile banking by Jordanian bank customers: Extending UTAUT2 with trust. *International Journal of Information Management*, *37*(3), 99–110. https://doi.org/10.1016/j.ijinfomgt.2017.01.002

Alalwan, A. A., Dwivedi, Y. K., Rana, N. P. P., & Williams, M. D. (2016). Consumer adoption of mobile banking in Jordan. *Journal of Enterprise Information Management*, *29*(1), 118–139. https://doi.org/10.1108/JEIM-04-2015-0035

Alampay, E. A., Moshi, G. C., Ghosh, I., Peralta, M. L. C., & Harshanti, J. (2017). The impact of mobile financial services in low- and lower-middle-income countries. In *International Development Research Centre*. https://doi.org/10.4314/jolte.v2i1.51998

Alba, J. W., & Hutchinson, J. W. (1987). Dimensions of Consumer Expertise. *Journal of Consumer Research*, *13*(4), 411. https://doi.org/10.1086/209080

Albakri, D. (2017). Khairy: Malaysia to be cashless society by 2050.

Allen, E., & Seaman, C. A. (2007). Likert Scales and Data Analyses. *Quality Progress*, 64–65.

Alreck, P. L., & Settle, R. B. (2003). *The Survey Research Handbook* (3rd ed.). McGraw-Hill Education.

Alton, L. (2017). Phone Calls, Texts Or Email? Here's How Millennials Prefer To Communicate.

Alwahaishi, S., & Snásel, V. (2013). Consumers' Acceptance and Use of Information and Communications Technology: A UTAUT and Flow Based Theoretical Model. *Journal of Technology Management & Innovation*, *8*(2), 61–73. https://doi.org/10.4067/S0718-27242013000200005

Amin, H. (2008). Factors affecting the intentions of customers in Malaysia to use mobile phone credit cards. *Management Research News*, *31*(7), 493–503. https://doi.org/10.1108/01409170810876062

Amin, H., Rahim Abdul Rahman, A., Laison Sondoh, S., & Magdalene Chooi Hwa, A. (2011). Determinants of customers' intention to use Islamic personal financing. *Journal of Islamic Accounting and Business Research*, *2*(1), 22–42. https://doi.org/10.1108/17590811111129490

Amin, H., Supinah, R., Aris, M. M., & Baba, R. (2012). Receptiveness of mobile banking by Malaysian local customers in Sabah: An empirical investigation. *Journal of Internet Banking and Commerce*, *17*(1), 1–12. https://doi.org/10.1007/978-3-531-92534-9_12

AMP News. (2019). Marketing to Millennials, the digital natives.

Anderson, J., Schwager, P., & L Kerns, R. (2006). The Drivers for Acceptance of Tablet PCs by Faculty in a College of Business. In *Journal of Information Systems Education* (Vol. 17).

Anna. (2019). Top 10 e-commerce and online payments trends in 2019.

Armstrong, J. S., & Overton, T. S. (1977). Estimating nonresponse bias in mail surveys. *Journal of Marketing Research*, *14*(3), 396–402. https://doi.org/10.2307/3150783

Ashta, A. (2017). Evolution of Mobile Banking Regulations: A Case Study on Legislator's Behavior. *Strategic Change*, *26*(1), 3–20. https://doi.org/10.1002/jsc.2105

Awwad, M. S., & Al-Majali, S. M. (2015). Electronic library services acceptance and use. *The Electronic Library*, *33*(6), 1100–1120. https://doi.org/10.1108/EL-03-2014-0057

Ayeh, J. K. (2015). Travellers' acceptance of consumer-generated media: An integrated model of technology acceptance and source credibility theories. *Computers in Human Behavior*, *48*, 173–180. https://doi.org/10.1016/j.chb.2014.12.049

Babbie, E. R. (2015). *The Practice of Social Research* (14th ed.). Retrieved from http://www.worldcat.org/title/practice-of-social-research/oclc/44076041

Bachman, L. F. (2004). *Statistical analyses for language assessment*. New York: Cambridge University Press.

Bagozzi, R. (2011). Measurement and Meaning in Information Systems and Organizational Research: Methodological and Philosophical Foundations. *MIS Quarterly*, *35*(2), 261–292. Retrieved from http://aisel.aisnet.org/misq/vol35/iss2/4

Bandura, A. (1986). *Social Foundations of Thought and Action: A Social CognitiveTheory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, Albert. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, *50*(2), 248–287. https://doi.org/10.1016/0749-5978(91)90022-L

Bank Negara Malaysia. (2014). New Pricing for Cheques will now take effect on 2 January 2015. *Bank Negara Malaysia*. Retrieved from http://www.bnm.gov.my/index.php?ch=en_press&pg=en_press&ac=557&lang=en

Bank Negara Malaysia. (2016a). Driving towards electronic payments. *Bank Negara Malaysia*. Retrieved from http://www.bnm.gov.my/index.php?ch=ps&pg=ps_mep_drv_toward&ac=193&lang=en

Bank Negara Malaysia. (2016b). Financial Stability and Payment Systems Report 2015. In *The Financial Stability and Payment Systems Report 2015*.

Bank Negara Malaysia. List of Regulatees. , Central Bank of Malaysia § (2017).

Bank Negara Malaysia. (2017b). Payment Systems in Malaysia. *Bank Negara Malaysia*.

Bank Negara Malaysia. (2019). Internet Banking and Mobile Banking Subscribers (end of period).

Bao, A. (2018). Integrating Mobile Payments to Attract New Customers from China.

Baptista, G., & Oliveira, T. (2015). Understanding mobile banking: The unified theory of acceptance and use of technology combined with cultural moderators. *Computers in Human Behavior*, *50*, 418–430. https://doi.org/10.1016/j.chb.2015.04.024

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173.

BasGöze, P. (2015). Integration Of Technology Readniess (TR) Into The Technology Acceptance Model (TAM) for M-Shopping. *International Journal of Scientific Research and Innovative Technology*, *2*(3), 26–35.

Bauer, H. H., Reichardt, T., Barnes, S. J., & Neumann, M. M. (2005). Driving consumer acceptance of mobile marketing: A theoretical framework and empirical study. *Journal of Electronic Commerce Research*, *6*(3), 188–192. https://doi.org/10.1145/1964921.1964970

Baumgartner, H. (2002). Toward a Personology of the Consumer. *Journal of Consumer Research*, *29*(2), 286–292. https://doi.org/10.1086/341578

Belkhamza, Z., & Azizi Wafa, S. (2014). The Role of Uncertainty Avoidance on E-Commerce Acceptance across Cultures. *International Business Research*, *7*(5), 166–173. https://doi.org/10.5539/ibr.v7n5p166

Benbasat, I., & Barki, H. (2007). Quo vadis TAM? In *J. AIS* (Vol. 8).

Bernama. (2017, July). TN50 prepares nation for industrial revolution Najib. *THEEDGE FINANCIAL DAILY*, p. 12.

Bernama. (2019a). Malaysia still some way from being a cashless society - PayNet.

Bernama. (2019b). Malaysia to have fastest internet access speed in Southeast Asia — Wan Azizah.

Bettman, J. R., & Sujan, M. (1987). Effects of Framing on Evaluation of Comparable and Noncomparable Alternatives by Expert and Novice Consumers. *Journal of Consumer Research*, Vol. 14, pp. 141–154. https://doi.org/10.2307/2489407

Bezhovski, Z. (2016). The Future of the Mobile Payment as Electronic Payment System. *European Journal of Business and Management*, *8*(8), 2222–2839.

Bhatti, K. K., & Qureshi, T. M. (2007). Impact of Employee Participation on Job Satisfaction, Employee Commitment and Employee Productivity. *International Review of Business Research Papers*, *3*(2), 54–68.

Bietenbeck, F., Zimmermann, H., Weis, T., Pauli, J., & Herwig, J. (2019). *Two-dimensional symbol code and method for reading the symbol code*.

Bilgihan, A. (2016). Gen y customer loyalty in online shopping: An integrated model of trust, user experience and branding. *Computers in Human Behavior*, *61*, 103–113. https://doi.org/10.1016/j.chb.2016.03.014

Birdsall, N. (2010). The (Indispensable) Middle Class in Developing Countries; or, The Rich and the Rest, Not the Poor and the Rest Introduction. *Center for Global Development*.

Blauw, S. L., & Franses, P. H. (2011). *The Impact of Mobile Telephone Use Households in Uganda on Economic Development of*.

Bollen, K. A. (1989). *Structural Equations with Latent Variables* (1st ed.). Canada: Wiley-Interscience.

Boon-itt, S. (2015). Managing self-service technology service quality to enhance e-satisfaction. *International Journal of Quality and Service Sciences*, *7*(4), 373–391. https://doi.org/10.1108/IJQSS-01-2015-0013

Bothun, D., Glisson, S., Haas, R., Issac, C., & Lieberman, M. (2013). Consumer Intelligence Series: Opening the Mobile Wallet. *PricewaterhouseCoopers LLP*, 1–11.

Bradley, J. (2009). The Technology Acceptance Model and Other User Acceptance Theories. In *Handbook of Research on Contemporary Theoretical Models in Information Systems* (pp. 277–294). https://doi.org/10.4018/978-1-60566-659-4.ch015

Brophy, M. (2019). 6 Best Mobile Credit Card Processing Options 2019.

Brown, S. A., Dennis, A. R., & Venkatesh, V. (2010). Predicting Collaboration Technology Use: Integrating Technology Adoption and Collaboration Research. *Journal of Management Information Systems*, *27*(2), 9–54. https://doi.org/10.2753/MIS0742-1222270201

Brucks, M. (1985). The Effects of Product Class Knowledge on Information Search Behavior. *Journal of Consumer Research*, *12*(1), 1. https://doi.org/10.1086/209031

Bryman, A., & Bell, E. (2011). *Business research methods* (3rd ed.). Oxford, England: Oxford University Press.

Burns, A. C., & Bush, R. F. (2014). *Marketing research*. Pearson.

Byrne, B. M. (2013). *Structural equation modeling with AMOS : basic concepts, applications, and programming*. New York: Routledge Taylor and Francis Group.

Carlsson, C., Carlsson, J., Hyvönen, K., Puhakainen, J., & Walden, P. (2006). Adoption of mobile devices/services - Searching for answers with the UTAUT. *Proceedings of the Annual Hawaii International Conference on System Sciences*, *6*(C), 1–10. https://doi.org/10.1109/HICSS.2006.38

Carter, L., Christian Shaupp, L., Hobbs, J., & Campbell, R. (2011). The role of security and trust in the adoption of online tax filing. *Transforming Government: People, Process and Policy*, *5*(4), 303–318. https://doi.org/10.1108/17506161111173568

Carver, C. S., & Connor-Smith, J. (2010). Personality and Coping. *Annual Review of Psychology*, *61*(1), 679–704. https://doi.org/10.1146/annurev.psych.093008.100352

Casey, T., & Wilson-Evered, E. (2012). Predicting uptake of technology innovations in online family dispute resolution services: An application and extension of the UTAUT. *Computers in Human Behavior*, *28*(6), 2034–2045. https://doi.org/10.1016/j.chb.2012.05.022

Cavana, R. Y., Delahaye, B. L., & Sekaran, U. (2001). *Applied Business Research: Qualitative and Quantitative Methods*. Milton: John Wiley & Sons Australia.

Celik, H. (2016). Customer online shopping anxiety within the Unified Theory of Acceptance and Use Technology (UTAUT) framework. *Asia Pacific Journal of Marketing and Logistics*, *28*(2), 278–307. https://doi.org/10.1108/APJML-05-2015-0077

Chang, T.-K. (2014). A Secure Operational Model for Mobile Payments. *The Scientific World Journal*, *2014*, 1–14. https://doi.org/10.1155/2014/626243

Changchun, G., Haider, M. J., & Akram, T. (2017). Investigation of the Effects of Task Technology Fit, Attitude and Trust on Intention to Adopt Mobile Banking: Placing the Mediating Role of Trialability. *International Business Research*, *10*(4), 77. https://doi.org/10.5539/ibr.v10n4p77

Chaouali, W., Ben Yahia, I., & Souiden, N. (2016). The interplay of counter-conformity motivation, social influence, and trust in customers' intention to adopt Internet banking services: The case of an emerging country. *Journal of Retailing and Consumer Services*, *28*, 209–218. https://doi.org/10.1016/j.jretconser.2015.10.007

Charlton Media Group. (2018). South Korea to allow payment via QR code by 2019 | Asian Banking & Finance.

Cheah, C. M., Teo, A. C., Sim, J. J., Oon, K. H., & Tan, B. I. (2011). Factors Affecting Malaysian Mobile Banking Adoption: An Empirical Analysis. *International Journal of Network and Mobile Technologies*, *2*(3), 149–160. Retrieved from http://ijnmt.com/

Chen, L., Gillenson, M. L., & Sherrell, D. L. (2002). Enticing online consumers: an extended technology acceptance perspective. *Information & Management*, *39*(8), 705–719. https://doi.org/10.1016/S0378-7206(01)00127-6

Chen, S. (2017). The rise of the QR code and how it has forever changed China's social habits.

Chetty, P. (2014). What are e-wallets?

Chien-Hsin Lin, Hsin-Yu Shih, Sher, P. J., & Yen-Li Wang. (2005). Consumer adoption of e-service: integrating technology readiness with the technology acceptance model. *A Unifying Discipline for Melting the Boundaries Technology Management:*, *4*(16), 483–488. https://doi.org/10.1109/PICMET.2005.1509728

Chin, E. S. M. (2018). It's official: WeChat Pay coming to Malaysia this month!

Chin, W. W. (1988). The Partial Least Squares Approach to Structural Equation Modeling. In G. A. Marcoulides (Ed.), *Modern methods for business research*. Mahwah, New Jersey, London: Lawrence Erlbaum Associates.

Chin, W. W. (2010). How to Write Up and Report PLS Analyses. In *Handbook of Partial Least Squares* (pp. 655–690). https://doi.org/10.1007/978-3-540-32827-8_29

Chin, W. W., Marcolin, B. L., & Newsted, P. R. (2003). A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from a Monte Carlo Simulation Study and an Electronic-Mail Emotion/ Adoption Study. *Information Systems Research*, *14*(2), 189–217. https://doi.org/10.1287/isre.14.2.189.16018

Chiu, J. L., Bool, N. C., & Chiu, C. L. (2017). Challenges and factors influencing initial trust and behavioral intention to use mobile banking services in the Philippines. *Asia Pacific Journal of Innovation and Entrepreneurship*, *11*(2), 246–278. https://doi.org/10.1108/APJIE-08-2017-029

Cho, J., Quinlan, M. M., Park, D., & Noh, G.-Y. (2014). Determinants of Adoption of Smartphone Health Apps among College Students. *American Journal of Health Behavior*, *38*(6), 860–870. https://doi.org/10.5993/AJHB.38.6.8

Churchill, G. A. (1979). A Paradigm for Developing Better Measures of Marketing Constructs. *Journal of Marketing Research*, *16*(1), 64. https://doi.org/10.2307/3150876

Churchill, G. A., & Peter, J. P. (1984). Research Design Effects on the Reliability of Rating Scales: A Meta-Analysis. *Journal of Marketing Research*, *21*(4), 360. https://doi.org/10.2307/3151463

CIMB. (2018a). CIMB PAY – Your mobile phone is your new wallet.

CIMB. (2018b). *Malaysia Strategy Monthly wrap-up for Oct 2018*. Malaysia: CGSCIMB.

Cimperman, M., Makovec Brenčič, M., & Trkman, P. (2016). Analyzing older users' home telehealth services acceptance behavior-applying an Extended UTAUT model. *International Journal of Medical Informatics*, *90*, 22–31. https://doi.org/10.1016/j.ijmedinf.2016.03.002

Claudet, I. (2015). Dutch Lady Malaysia Re-Launches Its Number One Brand, Dutch Lady PureFarm.

Cohen, J. (1988). Chi-Square Tests for Goodness of Fit and Contingency Tables. In *Statistical Power Analysis for the Behavioral Sciences* (2nd ed., pp. 215–271). https://doi.org/10.1016/B978-0-12-179060-8.50012-8

Cohen, L., Manion, L., & Morrison, K. (2011). *Research Methods in Education* (7th ed.). New York: Routledge.

Compeau, D. R., & Higgins, C. A. (1995). Application of Social Cognitive Theory to Training for Computer Skills. *Information Systems Research*, *6*(2), 118–143. https://doi.org/10.1287/isre.6.2.118

Connor-Smith, J. K., & Flachsbart, C. (2007). Relations between personality and coping: A meta-analysis. *Journal of Personality and Social Psychology*, *93*(6), 1080–1107. https://doi.org/10.1037/0022-3514.93.6.1080

Cooper, D., & Schindler, P. (2014). *Business Research Methods* (11th ed.). Retrieved from http://highered.mheducation.com/sites/0073373702/student_view0/index.html

Couper, M. P., Traugott, M. W., & Lamias, M. J. (2001). Web Survey Design and Administration. *Public Opinion Quarterly*, *65*(2), 230–253. https://doi.org/10.1086/322199

Courbe, J. (2016). *Financial Services Technology 2020 and Beyond: Embracing disruption*. 48. https://doi.org/https://doi.org/10.1093/itnow/bww026

Crabbe, M., Standing, C., Standing, S., & Karjaluoto, H. (2009). An adoption model for mobile banking in Ghana. *International Journal of Mobile Communications*, *7*(5), 515–543. https://doi.org/10.1504/IJMC.2009.024391

Creswell, J. W. (2012). Educational research: Planning, conducting, and evaluating quantitative and qualitative research. In *Educational Research* (Vol. 4). https://doi.org/10.1017/CBO9781107415324.004

Creswell, J. W. (2014). *Research Design Qualitative, Quantitative and Mixed Methods Approaches* (4th ed., Vol. 53). https://doi.org/10.1017/CBO9781107415324.004

Cuong, D. X., Linh, P. T., & Ha, P. N. (2015). Factors Affecting Intention to Use Facebook-Banking of Generation Y in Vietnam. *International Journal of Financial Research*, *6*(4), 68–75. https://doi.org/10.5430/ijfr.v6n4p68

Dai, H., Iyer, L. S., & Singh, R. (2007). An Investigation of Consumer's Security and Privacy Perceptions in Mobile Commerce. *AMCIS*. Retrieved from https://www.semanticscholar.org/paper/An-Investigation-of-Consumer's-Security-and-Privacy-Dai-Iyer/c15c2ec0790f8841395df086dd5c31b2ce2f1c78

Daud, N. M., Ezalin, N., Kassim, M., Seri, W., Wan, R., Said, M., & Noor, M. M. (2011). Determining Critical Success Factors of Mobile Banking Adoption in Malaysia. *Australian Journal of Basic and Applied Sciences*, *5*(9), 252–265.

Davis, F. D. (1986). *A Technology Acceptance Model for Empirically Testing New End-User Information Systems*. Sloan School of Management. Massachusetts Institute of Technology.

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, *13*(3), 319. https://doi.org/10.2307/249008

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science*, *35*(8), 982–1003. https://doi.org/10.1287/mnsc.35.8.982

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and Intrinsic Motivation to Use Computers in the Workplace1. *Journal of Applied Social Psychology*, *22*(14), 1111–1132. https://doi.org/10.1111/j.1559-1816.1992.tb00945.x

DBS Group Research. (2015). *Regional Industry Focus Asean Banks*. Singapore.

Debasish, S. S., & Dey, S. (2015). *Factors Affecting Adoption of Mobile Banking : An Empirical Study in the State of Odisha*. *9519*(February 2012).

Deci, E. L. (1975). *Intrinsic motivation*. New York: Plenum.

deleteHair, Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate analysis: A global perspective*. US: Pearson Education, Inc.

Deloitte. (2018). *2019 Banking and Capital Markets Outlook: reimagining transformation*. Deloitte Development LLC.

Deng, Z., Mo, X., & Liu, S. (2014). Comparison of the middle-aged and older users' adoption of mobile health services in China. *International Journal of Medical Informatics*, *83*(3), 210–224. https://doi.org/10.1016/j.ijmedinf.2013.12.002

Department of Statistics. (2019). POPULATION QUICK INFO.

Department of Statistics Malaysia. (2017). Report of Household Income And Basic Amenities Survey 2016.

Dillon, A., & Morris, M. G. (1996). User Acceptance of Information Technology: Theories and Models. *Annual Review of Information Science and Technology*, *31*, 3–32. Retrieved from https://utexas.influuent.utsystem.edu/en/publications/user-acceptance-of-information-technology-theories-and-models

Dimitriadis, S., & Kyrezis, N. (2010). Linking trust to use intention for technology-enabled bank channels: The role of trusting intentions. *Psychology and Marketing*, *27*(8), 799–820. https://doi.org/10.1002/mar.20358

Ding, Y., & Chai, K. H. (2015). Emotions and continued usage of mobile applications. *Industrial Management & Data Systems*, *115*(5), 833–852. https://doi.org/10.1108/IMDS-11-2014-0338

DongPing Tang, & LianJin Chen. (2011). A review of the evolution of research on information Technology Acceptance Model. *2011 International Conference on Business Management and Electronic Information*, 588–591. https://doi.org/10.1109/ICBMEI.2011.5917980

Donner, J., & Tellez, C. A. (2008). Mobile banking and economic development: linking adoption, impact, and use. *Asian Journal of Communication*, *18*(4), 318–332. https://doi.org/10.1080/01292980802344190

Dumeresque, D. (2012). The net generation: its impact on the business landscape. *Strategic Direction*, *28*(9), 3–5. https://doi.org/10.1108/02580541211256611

Dupree, J. (2002). Techno-Ready Marketing: How and Why Your Customers Adopt Technology20021A. Parasuraman, Charles L. Coby. Techno-Ready Marketing: How and Why Your Customers Adopt Technology . New York, NY: Free Press 2000. 202 pp. $27.50. *Journal of Consumer Marketing*, *19*(4), 359–361. https://doi.org/10.1108/jcm.2002.19.4.359.1

Dwivedi, Y. K., Rana, N. P., Jeyaraj, A., Clement, M., & Williams, M. D. (2017). Re-examining the Unified Theory of Acceptance and Use of Technology (UTAUT): Towards a Revised Theoretical Model. *Information Systems Frontiers*, 1–16. https://doi.org/10.1007/s10796-017-9774-y

Efma and Oracle Financial Services. (2010). *Are Banks Ready for Next Generation Customers? A Survey Report on Gen-Y Banking*.

El Alfy, S., Gómez, J. M., & Ivanov, D. (2017). Exploring instructors' technology readiness, attitudes and behavioral intentions towards e-learning technologies in Egypt and United Arab Emirates. *Education and Information Technologies*, *22*(5), 2605–2627. https://doi.org/10.1007/s10639-016-9562-1

eMarketer. (2016). WeChat Is China's Most Popular Chat App.

Ensor, B., & Wannemacher, P. (2012). The State Of Mobile Banking 2012. *Forrester Research*.

Erdoğmuş, N., & Esen, M. (2011). An Investigation of the Effects of Technology Readiness on Technology Acceptance in e-HRM. *Procedia - Social and Behavioral Sciences*, *24*, 487–495. https://doi.org/10.1016/j.sbspro.2011.09.131

Ergeerts, G., Schrooyen, F., Beyers, R., De Kock, K., & Herck, T. Van. (2012). Vision towards an Open Electronic Wallet on NFC Smartphones. *International Journal on Advances in Internet Technology*, *5*. Retrieved from http://www.iariajournals.org/internet_technology/2012,

Escobar-Rodríguez, T., & Carvajal-Trujillo, E. (2014). Online purchasing tickets for low cost carriers: An application of the unified theory of acceptance and use of technology (UTAUT) model. *Tourism Management*, *43*, 70–88. https://doi.org/10.1016/j.tourman.2014.01.017

Faaeq, M. K., Rasheed, M. M., Al-ansi, A. A., Homaid, A. A., & Faieq, A. K. (2017). Factors Influencing Electronic Government Services Adoption in the Risky Environment : A Structural Equation Modelling Approach. *International Journal of Economic Research*, *14*(16), 531–542.

Falk, R. F., & Miller, N. B. (1992). *A primer for soft modeling*. University of Akron Press.

Faniran, A. O., & Odumeru, J. A. (2015). *Acceptance of Mobile Banking in Nigeria : A Modified TAM Approach*. 39–49.

Farah, M. F., Hasni, M. J. S., & Abbas, A. K. (2018). Mobile-banking adoption: empirical evidence from the banking sector in Pakistan. *International Journal of Bank Marketing*, *36*(7), 1386–1413. https://doi.org/10.1108/IJBM-10-2017-0215

Faria, M. G. (2013). Mobile Banking Adoption: A novel model in the Portuguese context. In *Master's Dissertations in Statistics and Information Management*.

Fernandes, V. (2012). M@n@gement. *M@n@gement*, *15*(1), 101–123.

Field, A. (2016). *An Adventure in Statistics: The Reality Enigma* (1st ed.). London: SAGE Publications Ltd.

Field, A., Miles, J., & Field, Z. (2009). Discovering Statistics Using SPSS. In *Sage Publication* (Vol. 58). https://doi.org/10.1234/12345678

Fishbein, & Ajzen. (1975). *Belief, attitude, intention and behaviour: An introduction to theory and research (PDF Download Available)*. Retrieved from https://www.researchgate.net/publication/233897090_Belief_attitude_intention_and_behaviour_An_introduction_to_theory_and_research

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, Mass: Addison-Wesley Pub. Co.

FMT News. (2019). 20 years for Malaysia to become cashless society, says PayNet.

Foo-Wah, L., Fakhrorazi, A., & Islam, R. (2019). CONSUMERS' PARSIMONY OF MOBILE INTERNET BANKING USAGE IN MALAYSIA. *Humanities & Social Sciences Reviews*, *7*(1), 239–248. https://doi.org/10.18510/hssr.2019.7128

Gao, S., Krogstie, J., & Siau, K. (2011). Developing an instrument to measure the adoption of mobile services. *Mobile Information Systems*, *7*(1), 45–67. https://doi.org/10.3233/MIS-2011-0110

Garson, G. D. (2016). *Partial Least Squares Regression and Structural Equation Models* (2016th ed.). USA: Statistical Associates Publishers.

Gefen, D. (2003). TAM or Just Plain Habit. *Journal of Organizational and End User Computing*, *15*(3), 1–13. https://doi.org/10.4018/joeuc.2003070101

Gefen, D., Karahanna, E., & Straub, D. W. (2003). *Inexperience and experience with online stores : the importance of TAM and trust*. *50*(3), 307–321. https://doi.org/10.1109/TEM.2003.817277

Ghezzi, A., Renga, F., Balocco, R., & Pescetto, P. (2010). Mobile payment applications: offer state of the art in the Italian market. *Info*, *12*(5), 3–22. https://doi.org/10.1108/14636691011071130

Gist, M. E., & Mitchell, T. R. (1992). Self-efficacy: a theoretical analysis of its determinants and malleability. *Academy of Management Review*, *17*, 183–211.

Gist, Marilyn E. (1987). Self-Efficacy: Implications for Organizational Behavior and Human Resource Management. *The Academy of Management Review*, *12*(3), 472. https://doi.org/10.2307/258514

Godoe, P., & Johansen, T. S. (2012). Understanding adoption of new technologies: Technology readiness and technoloy acceptance as an integrated concept. *Journal of European Psychology Students*, *3*(1), 38–53. https://doi.org/10.1017/CBO9781107415324.004

Gu, J.-C., Lee, S.-C., & Suh, Y.-H. (2009). Determinants of behavioral intention to mobile banking. *Expert Systems with Applications*, *36*(9), 11605–11616. https://doi.org/10.1016/j.eswa.2009.03.024

Guhr, N., Loi, T., Wiegard, R., & Breitner, M. H. (2013). Technology Readiness in Customers' Perception and Acceptance of M(obile)-Payment: An Empirical Study in Finland, Germany, the USA and Japan. *Wirtschaftsinformatik Proceedings 2013*, (March), 119–133.

Gummerus, J., & Pihlström, M. (2011). Context and mobile services' value-in-use. *Journal of Retailing and Consumer Services*, *18*(6), 521–533. https://doi.org/10.1016/j.jretconser.2011.07.002

Guo, X., Zhao, Y., Jin, Y., & Zhang, N. (2010). Theorizing A Two-Sided Adoption Model For Mobile Marketing Platforms. *ICIS 2010 Proceedings*. Retrieved from http://aisel.aisnet.org/icis2010_submissions/128

Gupta, A., & Arora, N. (2017). Consumer adoption of m-banking: a behavioral reasoning theory perspective. *International Journal of Bank Marketing*, *35*(4), 733–747. https://doi.org/10.1108/IJBM-11-2016-0162

Gupta, K. P., Manrai, R., & Goel, U. (2019). Factors influencing adoption of payments banks by Indian customers: Extending UTAUT with perceived credibility. *Journal of Asia Business Studies*, 00–00. https://doi.org/10.1108/JABS-07-2017-0111

Gupta, V. (2015). Mobile Banking and Mobile Wallets – What's the difference?

Ha, S., Chung, T.-L., Hamilton, J., & Park, J. (2010). Moving Beyond Acceptance: Exploring Determinants of Consumer Use of Mobile Services. *International Journal of Mobile Marketing*, *5*(2), 30–42. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=61262762&site=ehost-live

Habbal, F. (2017). The smartphone technology acceptance among emarati senior adults. *International Journal of Applied Engineering Research*, *12*(20), 10114–10120.

Hair, Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate Data Analysis: Global Edition* (7th ed.). London: Pearson Higher Education.

Hair, J., Black, W. C., Babin, B. J., & Anderson, R. E. (2009). *Multivariate data analysis* (7th ed.). Pearson Education Limited.

Hair, J., Black, W. C., Babin, B. J., & Anderson, R. E. (2013). Multivariate Data Analysis: Pearson New International Edition. In *Prentice-Hall, Inc* (7th ed.). The United States of America: Pearson Education Limited.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a Silver Bullet. *The Journal of Marketing Theory and Practice*, *19*(2), 139–152. https://doi.org/10.2753/MTP1069-6679190202

Hair, J., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2016). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (2nd ed.). Thousand Oaks, California: SAGE Publications, Inc.

Hair, J., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Marketing Science*, *40*(3), 414–433. https://doi.org/10.1007/s11747-011-0261-6

Hair, Ringle, C. M., & Sarstedt, M. (2013, March 14). *Editorial - Partial Least Squares Structural Equation Modeling: Rigorous Applications, Better Results and Higher Acceptance*. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2233795

Hajare, U., Mahajan, R., Jadhav, S., Pingale, N., & Salunke, S. (2018). Efficient Cash Withdrawal from ATM machine using Mobile Banking. *International Research Journal of Engineering and Technology*, *5*(1), 248–250.

Hanafizadeh, P., Behboudi, M., Abedini Koshksaray, A., & Jalilvand Shirkhani Tabar, M. (2014). Mobile-banking adoption by Iranian bank clients. *Telematics and Informatics*, *31*(1), 62–78. https://doi.org/10.1016/j.tele.2012.11.001

Harrington, H. (2018). How to Use QR Codes to Measure Marketing Efforts.

Harrison, D. A., Mykytyn, P. P., Jr., & Riemenschneider, C. K. (1997). Executive Decisions About Adoption of Information Technology in Small Business: Theory and Empirical Tests. *Information Systems Research*, Vol. 8, pp. 171–195. https://doi.org/10.2307/23010902

Hart, S. (2019). The best wallet 2019: for carrying your coins, cash and credit cards.

Hasz, C. C. (2018). THE IMPATIENT GENERATION: REDEFINING THE MILLENNIAL WORKFORCE.

Hayashi, F., & Bradford, T. (2014). Mobile Payments : Merchants ' Perspectives. *Economic Review*, 33–58.

Hecht, D. (2013). The neural basis of optimism and pessimism. *Experimental Neurobiology*, *22*(3), 173–199. https://doi.org/10.5607/en.2013.22.3.173

Henry, D. (2018). How digitisation is transforming Malaysia's payments landscape. Retrieved September 7, 2019, from Bankless Times website: https://www.banklesstimes.com/2018/05/27/how-digitisation-transforming-malaysias-payments/

Henseler, Jörg, & Fassott, G. (2010). Testing Moderating Effects in PLS Path Models: An Illustration of Available Procedures. In V. Esposito Vinzi, Chin, J. Henseler, & H. Wang (Eds.), *Handbook of Partial Least Squares* (pp. 713–735). https://doi.org/10.1007/978-3-540-32827-8_31

Henseler, Jorg, Ringle, C. M., & Sinkovics, R. R. (2009). The Use of Partial Least Squares Path Modeling in International Marketing. *Journal of the Academy of Marketing Science*, *20*(3), 277–319. https://doi.org/10.1108/S1474-7979(2009)0000020014

Henseler, Jorg, & Sarstedt, M. (2013). Goodness-of-fit indices for partial least squares path modeling. *Computational Statistics*, *28*(2), 565–580. https://doi.org/10.1007/s00180-012-0317-1

Hochstim, J. R., & Athanasopoulos, D. A. (1970). Personal Follow-Up in a Mail Survey: Its Contribution and Its Cost. *Public Opinion Quarterly*, *34*(1), 69. https://doi.org/10.1086/267774

Hofstede Insights. (2019). COUNTRY COMPARISON.

Holley, J. (2008). Generation Y: Understanding the Trend and Planning for the Impact. *2008 32nd Annual IEEE International Computer Software and Applications Conference*, 2–2. https://doi.org/10.1109/COMPSAC.2008.204

Hong Leong Bank. (2017). Connect Mobile Banking App.

Hoofnagle, C. J., Urban, J. M., & Li, S. (2012). Mobile Payments: Consumer Benefits & New Privacy Concerns. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2045580

Hoque, M. R. (2016). An empirical study of mHealth adoption in a developing country: the moderating effect of gender concern. *BMC Medical Informatics and Decision Making*, *16*(1), 51. https://doi.org/10.1186/s12911-016-0289-0

Hoque, R., & Sorwar, G. (2017). Understanding factors influencing the adoption of mHealth by the elderly: An extension of the UTAUT model. *International Journal of Medical Informatics*, *101*, 75–84. https://doi.org/10.1016/j.ijmedinf.2017.02.002

Hosseini, M. H., Fatemifar, A., & Rahimzadeh, M. (2015). *Effective Factors of the Adoption of Mobile Banking Services By Customers*. *4*(6), 1–13.

Hsu, C.-L., Lin, Y.-H., Chen, M.-C., Chang, K.-C., & Hsieh, A.-Y. (2017). Investigating the determinants of e-book adoption. *Program*, *51*(1), 2–16. https://doi.org/10.1108/PROG-04-2014-0022

Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: a review of four recent studies. *Strategic Management Journal*, *20*(2), 195–204. https://doi.org/10.1002/(SICI)1097-0266(199902)20:2<195::AID-SMJ13>3.0.CO;2-7

Hur, H. J., Lee, H. K., & Choo, H. J. (2017). Understanding usage intention in innovative mobile app service: Comparison between millennial and mature consumers. *Computers in Human Behavior*, *73*, 353–361. https://doi.org/10.1016/j.chb.2017.03.051

Idris, A. N. (2018). Tech: Cashless payments — powering the future of retail | The Edge Markets.

Igbaria, M., Parasuraman, S., & Baroudi, J. J. (1996). A Motivational Model of Microcomputer Usage. *Journal of Management Information Systems*, *13*(1), 127–143. https://doi.org/10.1080/07421222.1996.11518115

Igbaria, M., Schiffman, S. J., & Wieckowski, T. J. (1994). The respective roles of perceived usefulness and perceived fun in the acceptance of microcomputer technology. *Behaviour & Information Technology*, *13*(6), 349–361. https://doi.org/10.1080/01449299408914616

International Telecommunication Union (ITU). (2016). Measuring the Information Society Report 2016. In *ITU: Geneva*. https://doi.org/10.3359/oz0303157

International Trade Administration. (2018). Malaysia - eCommerce.

Isaias, P., Reis, F., Coutinho, C., & Lencastre, J. A. (2017). Empathic technologies for distance/mobile learning. *Interactive Technology and Smart Education*, *14*(2), 159–180. https://doi.org/10.1108/ITSE-02-2017-0014

Ismail, B. T., & Masinge, K. (2011). *Working Paper Series Mobile banking : Innovation for the poor*. (31).

Ivatury, G., & Mas, I. (2008, April 1). *The Early Experience with Branchless Banking*. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1655257

Jackson, S. L. (2012). *Research Methods and Statistics: A Critical Thinking Approach* (4th ed.). Cengage Learning.

Jayaseelan, R. (2017). The e-wallet race hots up.

John, D. R., Scott, C. A., & Bettman, J. R. (1986). Sampling Data for Covariation Assessment: The Effect of Prior Beliefs on Search Patterns. *Journal of Consumer Research*, *13*(1), 38. https://doi.org/10.1086/209046

Jones, O. (2017). Payment Card Image Backup. *Technical Disclosure Commons*, *Marc h*, 1–8.

Junadi, & Sfenrianto. (2015). A Model of Factors Influencing Consumer's Intention to Use E-payment System in Indonesia. *Procedia Computer Science*, *59*(Iccsci), 214–220. https://doi.org/10.1016/j.procs.2015.07.557

Kana, G. (2017). Higher household income not equal to higher consumption.

Kang, M., Heo, H., & Kim, M. (2011). The impact of ICT use on new millennium learners' educational performance. *Interactive Technology and Smart Education*, *8*(1), 18–27. https://doi.org/10.1108/17415651111125487

Karahanna, E., Straub, D. W., & Chervany, N. L. (1999). Adoption across technology information time : A cross-sectional comparison of pre-adoption and post-adoption beliefs. *MIS Quarterly*, *23*(2), 183–213. https://doi.org/10.2307/249751

Karma, N. G., Ibrahim, S. B., & Ali, A. H. (2014). Key Factors Affecting Mobile Banking Adoption Among Banks ' Customers in Sudan. *International Journal of Liberal Arts and Social Science*, *2*(6), 112–122.

Kaur, K., & Pathak, A. (2015). E-Payment System on E-Commerce in India. *International Journal of Engineering Research and Applications*, *5*(2), 79–87.

Kaur, M. (2018). Gap between rich, middle-income earners set to widen further.

Keegan, W. J., & Green, M. C. (2014). *Global marketing*. United States of America: Pearson Education, Inc.

Keller, G. (2014). *Statistics for management and economics.* New York: Duxubury press.

Khalilzadeh, J., Ozturk, A. B., & Bilgihan, A. (2017). Security-related factors in extended UTAUT model for NFC based mobile payment in the restaurant industry. *Computers in Human Behavior*, *70*, 460–474. https://doi.org/10.1016/j.chb.2017.01.001

Khazanah Research Institute. (2016). *The State of Households II*.

Khazanah Research Institute. (2018). *THE STATE OF HOUSEHOLDS 2018 Different Realities* (3rd ed.). Kuala Lumpur, Malaysia: Khazanah Research Institute.

Khechine, H., Lakhal, S., & Ndjambou, P. (2016). A meta-analysis of the UTAUT model: Eleven years later. *Canadian Journal of Administrative Sciences*, *33*(2), 138–152. https://doi.org/10.1002/cjas.1381

Kim, J. B., & Kang, S. (2012). A study on the factors affecting the intention to use smartphone banking: The differences between the transactions of account check and account transfer. *International Journal of Multimedia and Ubiquitous Engineering*, *7*(3), 87–96. https://doi.org/10.1109/IACSIT-SC.2009.13

Kim, J., & Park, H.-A. (2012). Development of a Health Information Technology Acceptance Model Using Consumers' Health Behavior Intention. *Journal of Medical Internet Research*, *14*(5), e133. https://doi.org/10.2196/jmir.2143

Kishore, S. K., & Sequeira, A. H. (2016). An Empirical Investigation on Mobile Banking Service Adoption in Rural Karnataka. *SAGE Open*, *6*(1), 1–21. https://doi.org/10.1177/2158244016633731

Kiwanuka, A. (2015). Acceptance Process: The Missing Link between UTAUT and Diffusion of Innovation Theory. *American Journal of Information Systems, Vol. 3, 2015, Pages 40-44*, *3*(2), 40–44. https://doi.org/10.12691/AJIS-3-2-3

Kline, R. B. (2015). *Principles and practice of structural equation modeling* (4th ed.). New York: Guilford Press.

Knutsen, L., Constantiou, I. D., & Damsgaard, J. (2005). Acceptance and Perceptions of Advanced Mobile Services: Alterations during a Field Study. *International Conference on Mobile Business (ICMB'05)*, 326–332. https://doi.org/10.1109/ICMB.2005.13

Koch, P. G. J., & Siering, M. (2017). Digital Finance and FinTech : current research and future research directions. *Journal of Business Economics*, *87*(5), 537–580. https://doi.org/10.1007/s11573-017-0852-x

Koduri, V. (2015). How Smartphones Will Become The Global Mobile Wallet.

Koenig-Lewis, N., Palmer, A., & Moll, A. (2010). Predicting young consumers' take up of mobile banking services. *International Journal of Bank Marketing*, *28*(5), 410–432. https://doi.org/10.1108/02652321011064917

Koksal, M. H. (2016). The intentions of Lebanese consumers to adopt mobile banking. *International Journal of Bank Marketing*, *34*(3), 327–346. https://doi.org/10.1108/IJBM-03-2015-0025

Kong, S. (2019). 5G: How ready are we?

Kongarchapatara, B. (2018). *Factors Affecting Adoption versus Behavioral Intention to Use QR Code Payment Application Factors Affecting Adoption versus Behavioral Intention to Use QR Code Payment Application Boonying Kongarchapatara * and Chalida Rodjanatara College of Management , .* (May).

Kothari, C. (2004). Research Methodology: Methods and Techniques. In *New Age International*. https://doi.org/http://196.29.172.66:8080/jspui/bitstream/123456789/2574/1/Research%20Methodology.pdf

Krejcie, R. V, & Morgan, D. W. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*, *30*(3), 607–610. https://doi.org/10.1177/001316447003000308

Krishanan, D., Khin, A. A., Low, K., & Teng, L. (2015). Attitude towards Using Mobile Banking in Malaysia : A Conceptual Framework. *British Journal of Economics, Management & Trade*, *7*(4), 306–315. https://doi.org/10.9734/BJEMT/2015/17660

Krosnick, J. A., & Fabrigar, L. R. (2012). Designing Rating Scales for Effective Measurement in Surveys. In *Survey Measurement and Process Quality* (pp. 141–164). https://doi.org/10.1002/9781118490013.ch6

Kuegler, M., Smolnik, S., & Räth, P. (2012). Why Don't You Use It? Assessing the Determinants of Enterprise Social Software Usage: A Conceptual Model Integrating Innovation Diffusion and Social Capital Theories. In *International Conference on Information Systems, ICIS 2012* (Vol. 5).

Kuo, K., Liu, C., & Ma, C. (2013). An investigation of the effect of nurses' technology readiness on the acceptance of mobile electronic medical record systems. *BMC Medical Informatics and Decision Making*, *13*(1), 88. https://doi.org/10.1186/1472-6947-13-88

Kwon, H. S., & Chidambaram. (2000). A test of the technology acceptance model: the case of cellular telephone adoption. *Proceedings of the 33rd Annual Hawaii International Conference on System Sciences*, *vol.1*, 7. https://doi.org/10.1109/HICSS.2000.926607

Larasati, I., Havidz, H., Kefan, X., Aima, M. H., & Ali, H. (2018). Intention to adopt WeChat Mobile Payment Innovation toward Indonesia Citizenship Based in China. *International Journal of Application or Innovation in Engineering & Management (IJAIEM)*, *7*(6), 105–117.

Laukkanen, T. (2007). Internet vs mobile banking: comparing customer value perceptions. *Business Process Management Journal*, *13*(6), 788–797. https://doi.org/10.1108/14637150710834550

Laukkanen, T., Sinkkonen, S., Kivijärvi, M., & Laukkanen, P. (2007). Innovation resistance among mature consumers. *Journal of Consumer Marketing*, *24*(7), 419–427. https://doi.org/10.1108/07363760710834834

Lee, C., & Coughlin, J. F. (2015). PERSPECTIVE: Older Adults' Adoption of Technology: An Integrated Approach to Identifying Determinants and Barriers. *Journal of Product Innovation Management*, *32*(5), 747–759. https://doi.org/10.1111/jpim.12176

Lee, K. C., & Chung, N. (2009). Understanding factors affecting trust in and satisfaction with mobile banking in Korea: A modified DeLone and McLean's model perspective. *Interacting with Computers*, *21*(5–6), 385–392. https://doi.org/10.1016/j.intcom.2009.06.004

Lees, D. S., & Cooper, M. H. (1963). A Preliminary Analysis of Research into General Practice. *Journal of the College of General Practitioners*, *6*(2), 233–241.

Lemieux, J., & McAlister, L. (2005). Handling Missing Values in Marketing Data: A Comparison of Techniques - MSI Web Site ». *Marketing Science Institute, 2*(1), 41–60. Retrieved from http://www.msi.org/reports/handling-missing-values-in-marketing-data-a-comparison-of-techniques/

Leon, S. (2018). Service mobile apps: a millennial generation perspective. *Industrial Management & Data Systems*, *118*(9), 1837–1860. https://doi.org/10.1108/IMDS-10-2017-0479

Leong, L. M., & Kasmuri, A. (2017, September). Why should Malaysia focus on Industry 4.0? *IM BizWatch*.

Leung, L. (2013). Generational differences in content generation in social media: The roles of the gratifications sought and of narcissism. *Computers in Human Behavior*, *29*(3), 997–1006. https://doi.org/10.1016/j.chb.2012.12.028

Li, F. (2013). Why users adopt mobile banking service: An empirical study. *2013 10th International Conference on Service Systems and Service Management*, 490–493. https://doi.org/10.1109/ICSSSM.2013.6602554

Li, J. P., & Kishore, R. (2006). How robust is the UTAUT instrument? *Proceedings of the 2006 ACM SIGMIS CPR Conference on Computer Personnel Research Forty Four Years of Computer Personnel Research: Achievements, Challenges & the Future - SIGMIS CPR '06*, 183. https://doi.org/10.1145/1125170.1125218

Liang, C.-C. (2016). Subjective Norms and Customer Adoption of Mobile Banking: Taiwan and Vietnam. *2016 49th Hawaii International Conference on System Sciences (HICSS)*, *2016-March*, 1577–1585. https://doi.org/10.1109/HICSS.2016.199

Liébana-Cabanillas, F., Muñoz-Leiva, F., & Sánchez-Fernández, J. (2015). Influence of age in the adoption of new mobile payment systems. *Review of Business Management*, 1390–1407. https://doi.org/10.7819/rbgn.v17i58.1989

Liebana-Cabanillas, F., Sanchez-Fernandez, J., & Munoz-Leiva, F. (2014). The moderating effect of experience in the adoption of mobile payment tools in Virtual Social Networks: The m-Payment Acceptance Model in Virtual Social Networks (MPAM-VSN). *International Journal of Information Management*, *34*(2), 151–166. https://doi.org/10.1016/j.ijinfomgt.2013.12.006

Liljander, V., Gillberg, F., Gummerus, J., & van Riel, A. (2006). Technology readiness and the evaluation and adoption of self-service technologies. *Journal of Retailing and Consumer Services*, *13*(3), 177–191. https://doi.org/10.1016/j.jretconser.2005.08.004

Lim, F.-W., Ahmad, F., & Talib, A. N. B. A. (2018). The State of the Art of E-Wallet Utilization via QR Code : An Empirical Analysis on M40 Millennials in Malaysia. *International Journal of Advanced Studies in Social Science & Innovation*, *2*(4), 43–63. https://doi.org/10.30690/ijassi.24.04

Lim, F. W., Yusuf, B. N. M., & Suanda, J. (2017). A Study on Factors Affecting Entrepreneurial Intentions Among Students in Higher Education Institutions in Northen region of Malaysia. *International Journal of Information Technology and Business Management*, *58*(1), 80–100.

Lin, C.-H., Shih, H.-Y., & Sher, P. J. (2007). Integrating technology readiness into technology acceptance: The TRAM model. *Psychology and Marketing*, *24*(7), 641–657. https://doi.org/10.1002/mar.20177

Lin, H.-F. (2011). An empirical investigation of mobile banking adoption: The effect of innovation attributes and knowledge-based trust. *International Journal of Information Management*, *31*(3), 252–260. https://doi.org/10.1016/j.ijinfomgt.2010.07.006

Lin, J. C., & Chang, H. (2011). The role of technology readiness in self-service technology acceptance. *Managing Service Quality: An International Journal*, *21*(4), 424–444. https://doi.org/10.1108/09604521111146289

Lin, J. C., & Hsieh, P. (2006). The role of technology readiness in customers' perception and adoption of self-service technologies. *International Journal of Service Industry Management*, *17*(5), 497–517. https://doi.org/10.1108/09564230610689795

Lin, J. C., & Hsieh, P. (2012). Refinement of the technology readiness index scale. *Journal of Service Management*, *23*(1), 34–53. https://doi.org/10.1108/09564231211208961

Lin, J. S. C., & Hsieh, P. L. (2007). The influence of technology readiness on satisfaction and behavioral intentions toward self-service technologies. *Computers in Human Behavior*, *23*(3), 1597–1615. https://doi.org/10.1016/j.chb.2005.07.006

LiveBank. (2019). What the future holds for digital banking? – upcoming year trends : 2019 trends in digital banking.

Lowry, P. B., & Gaskin, J. (2014). Partial Least Squares (PLS) Structural Equation Modeling (SEM) for Building and Testing Behavioral Causal Theory: When to Choose It and How to Use It. *IEEE Transactions on Professional Communication*, *57*(2), 123–146. https://doi.org/10.1109/TPC.2014.2312452

Lu, J., Yao, J. E., & Yu, C.-S. (2005). Personal innovativeness, social influences and adoption of wireless Internet services via mobile technology. *The Journal of Strategic Information Systems*, *14*(3), 245–268. https://doi.org/10.1016/j.jsis.2005.07.003

Lules, I., Omwansa, T. K., & Waema, T. M. (2012). Application of Technology Acceptance Model (TAM) in M-Banking Adoption in Kenya. *International Journal of Computing and ICT Research*, *6*(1), 31–43.

Luo, X., Li, H., Zhang, J., & Shim, J. P. (2010). Examining multi-dimensional trust and multi-faceted risk in initial acceptance of emerging technologies: An empirical study of mobile banking services. *Decision Support System*, *49*(2), 222–234. https://doi.org/10.1016/j.dss.2010.02.008

Machani, S. E. (2016). *Method and system for delivering a command to a mobile device*.

Macinati, M. S. (2008). The relationship between quality management systems and organizational performance in the Italian National Health Service. *Health Policy (Amsterdam, Netherlands)*, *85*(2), 228–241. https://doi.org/10.1016/j.healthpol.2007.07.013

Madan, K., & Yadav, R. (2016). Behavioural intention to adopt mobile wallet: a developing country perspective. *Journal of Indian Business Research*, *8*(3), 227–244. https://doi.org/10.1108/JIBR-10-2015-0112

Mahad, M., Mohtar, S., & Othman, A. A. (2015). The Effect of Perceived Trust of Mobile Banking Services in Malaysia. *International Academic Research Journal of Business and Technology*, *1*(2), 1–7.

Mahad, M., Mohtar, S., Yusoff, R. Z., & Othman, A. A. (2015). Factor affecting mobile adoption companies in Malaysia. *International Journal of Economics and Financial Issues*, *5*, 84–91.

Mahapatra, D. M., & Patra, S. K. (2016). Payments and Banking with Mobile Devices: A study of E-Wallet and Apps with Pragmatic view. *Journal of Management and Technology*, *12*(2), 51–56.

Mahfuz, M. A., Khanam, L., & Hu, W. (2016). Examine Website Quality on M-Banking Services Adoption in Bangladesh. *International Journal of Computer Science and Information Technology*, *8*(2), 33–50. https://doi.org/10.5121/ijcsit.2016.8203

Mahfuz, M. A., Khanam, L., & Mutharasu, S. A. (2016). The influence of website quality on m-banking services adoption in Bangladesh: Applying the UTAUT2 model using PLS. *2016 International Conference on Electrical, Electronics, and Optimization Techniques (ICEEOT)*, 2329–2335. https://doi.org/10.1109/ICEEOT.2016.7755110

Malaysian Trades Union Congress. (2015). Malaysia Needs Strong Middle Class Group To Grow Its Economy.

Malhotra, N. K., Hall, J., Shaw, M., & Oppenheim, P. P. (2008). *Essentials of marketing research an applied orientation* (2nd ed.). Australia: Pearson.

Manvi, S. S., Bhajantri, L. B., & Vijayakumar, M. A. (2009). Secure Mobile Payment System in Wireless Environment. *2009 International Conference on Future Computer and Communication*, 31–35. https://doi.org/10.1109/ICFCC.2009.125

Manzoor, E. D. A. (2010). *E-commerce: an introduction*.

Mao, E., Srite, M., Bennett Thatcher, J., & Yaprak, O. (2005). A Research Model for Mobile Phone Service Behaviors: Empirical Validation in the U.S. and Turkey. *Journal of Global Information Technology Management*, *8*(4), 7–28. https://doi.org/10.1080/1097198X.2005.10856406

Marcoulides, G. A., Chin, W. W., & Saunders, C. (2009). A critical look at partial least squares modeling. *MIS Quarterly*, *33*(1), 171–175.

Maroofi, F., Kahrarian, F., & Dehghani, M. (2013). An Investigation of Initial Trust in Mobile Banking. *International Journal of Academic Research in Business and Social Sciences*, *3*(9), 394–404. https://doi.org/10.6007/IJARBSS/v3-i9/228

Martín, H. S., & Herrero, Á. (2012). Influence of the user's psychological factors on the online purchase intention in rural tourism: Integrating innovativeness to the UTAUT framework. *Tourism Management*, *33*(2), 341–350. https://doi.org/10.1016/j.tourman.2011.04.003

Masrek, M. N., Mohamed, I. S., Daud, N. M., & Omar, N. (2014). Technology Trust and Mobile Banking Satisfaction: A Case of Malaysian Consumers. *Procedia - Social and Behavioral Sciences*, *129*, 53–58. https://doi.org/10.1016/j.sbspro.2014.03.647

Mathieson, K. (1991). Predicting User Intentions: Comparing the Technology Acceptance Model with the Theory of Planned Behavior. *Information Systems Research*, *2*(3), 173–191. https://doi.org/10.1287/isre.2.3.173

Matthing, J., Kristensson, P., Gustafsson, A., & Parasuraman, A. (2006). Developing successful technology-based services: the issue of identifying and involving innovative users. *Journal of Services Marketing*, *20*(5), 288–297. https://doi.org/10.1108/08876040610679909

Maybank2U. (2019). What is Maybank QRPayBiz?

MCMC. (2014). Hand Phone Users Survey.

MCMC. (2018). *Internet Users Survey 2018*. Malaysia: Malaysian Communications and Multimedia Commission (MCMC).

Meola, A. (2016). Future of Banking: IoT, Retail & Mobile Banking Industry Trends.

Mick, D. G., & Fournier, S. (1998). Paradoxes of Technology: Consumer Cognizance, Emotions, and Coping Strategies. *Journal of Consumer Research*, *25*(2), 123–143. https://doi.org/10.1086/209531

Miller, R. L. (n.d.). *Rogers' Innovation Diffusion Theory (1962, 1995)*. https://doi.org/10.4018/978-1-4666-8156-9.ch016

Ministry of Education Malaysia (MOHE). (2016). *Statistics*. Retrieved from http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx

MobileAPPtelligence. (2015). How can you distinguish between Mobile banking and Mobile wallet?

Mohammadi, H. (2015a). A study of mobile banking usage in Iran. *International Journal of Bank Marketing*, *33*(6), 733–759. https://doi.org/10.1108/IJBM-08-2014-0114

Mohammadi, H. (2015b). Investigating users' perspectives on e-learning: An integration of TAM and IS success model. *Computers in Human Behavior*, *45*, 359–374. https://doi.org/10.1016/j.chb.2014.07.044

MOLPay. (2016). Introducing PEx+ Merchant Payment by Hong Leong Bank.

Moore, G. C., & Benbasat, I. (1991). Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation. *Information Systems Research*, *2*(3), 192–222. https://doi.org/10.1287/isre.2.3.192

Moser, F. (2015). Mobile Banking. *International Journal of Bank Marketing*, *33*(2), 162–177. https://doi.org/10.1108/IJBM-08-2013-0082

Mothobi, O., & Grzybowski, L. (2017). Infrastructure deficiencies and adoption of mobile money in Sub-Saharan Africa. *Information Economics and Policy*, *40*, 71–79. https://doi.org/10.1016/j.infoecopol.2017.05.003

Mottain, M. (2017). M40 group in the middle-income trap?

Naranjo-Zolotov, M., Oliveira, T., & Casteleyn, S. (2018). Citizens' intention to use and recommend e-participation: Drawing upon UTAUT and citizen empowerment. *Information Technology and People*. https://doi.org/10.1108/ITP-08-2017-0257

Neufeld, D. J., Dong, L., & Higgins, C. (2007). Charismatic leadership and user acceptance of information technology. *European Journal of Information Systems*, *16*(4), 494–510. https://doi.org/10.1057/palgrave.ejis.3000682

Neuman, W. L. (2011). *Social Research Methods: Qualitative and Quantitative Approaches* (7th ed.). Boston: Allyn & Bacon.

Newman, D. (2019). Top 7 Digital Transformation Trends In Financial Services For 2019.

Nguyen, T. D., & Huynh, P. A. (2018). *The Roles of Perceived Risk and Trust on E–Payment Adoption*. https://doi.org/10.1007/978-3-319-73150-6_68

Nielsen. (2014). MILLENNIALS: TECHNOLOGY = SOCIAL CONNECTION.

Njenga, K., & Salih, S. (2019). *On Trust and Security Risk: Mobile Commerce Acceptance and Readiness in Sudan*. https://doi.org/10.1007/978-981-13-1059-1_4

Nunnally, J. C. (1970). *Introduction to Psychological Measurement*. McGraw-Hill.

Okazaki, S., Li, H., & Hirose, M. (2012). Benchmarking the Use of QR Code in Mobile Promotion. *Journal of Advertising Research*, *52*(1), 102–117. https://doi.org/10.2501/JAR-52-1-102-117

Olaleye, S. A., & Sanusi, I. T. (2019). The Need for Green Companies in Nigeria : A Study of Electronic Invoicing The Need for Green Study of Electronic Invoicing. *The African Journal of Information Systems*, *11*(1).

Olavide, D. (2012). Determinants of involvement in mobile commerce: the moderating role of gender. *...and Business Journal*, (april), 69–101. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2168161

Oliveira, T., Faria, M., Thomas, M. A., & Popovic, A. (2014). Extending the understanding of mobile banking adoption: When UTAUT meets TTF and ITM. *International Journal of Information Management*, *34*(5), 689–703. https://doi.org/10.1016/j.ijinfomgt.2014.06.004

Oliveira, T., & Martins, M. (2011). Literature review of Information Technology Adoption Models at Firm Level. *Electronic Journal of Information ...*, *14*(1), 110–121.

Oluoch, R. A., Abaja, P. O., W.Mwangi, J., & Githeko, J. (2015). Factor Affecting Adoption of Mobile Banking Technology in Kenya: A Case of Bank Customers within Nakuru Municipality. *Asian Journal of Business and Management Sciences*, *2*(11), 1–13. https://doi.org/10.1017/CBO9781107415324.004

Owusu Kwateng, K., Osei Atiemo, K. A., & Appiah, C. (2019). Acceptance and use of mobile banking: an application of UTAUT2. *Journal of Enterprise Information Management*, *32*(1), 118–151. https://doi.org/10.1108/JEIM-03-2018-0055

Pallant, J. (2003). *SPSS survival manual: A step by step guide to data analysis using SPSS for Windows* (3rd ed.). New York, USA: McGraw-Hill.

Pallant, J. (2007). *Survival mannual: A step by step guide for data analysis using SPSS for windows*. England: McGraw-Hill.

Pallant, Julie. (2002). *Spss Survival Manual*. 354. Retrieved from http://www.academia.dk/BiologiskAntropologi/Epidemiologi/PDF/SPSS_Survival_Manual_Ver12.pdf

Pallant, Julie. (2013). *SPSS survival manual : a step by step guide to data analysis using IBM SPSS*. McGraw Hill.

Parasuraman, A. (2000a). Technology Readiness Index (Tri): A Multiple-Item Scale to Measure Readiness to Embrace New Technologies. *Journal of Service Research*, *2*(4), 307–320. https://doi.org/10.1177/109467050024001

Parasuraman, A. (2000b). Technology Readiness Index (Tri). *Journal of Service Research*, *2*(4), 307–320. https://doi.org/10.1177/109467050024001

Parasuraman, A., & Colby, C. L. (2007). *Techno-Ready Marketing: How and Why Your Customers Adopt Technology*. New York, NY, USA: Free Press.

Parasuraman, A., & Colby, C. L. (2015). An Updated and Streamlined Technology Readiness Index. *Journal of Service Research*, *18*(1), 59–74. https://doi.org/10.1177/1094670514539730

Parker, L. (1992). Collecting data the e-mail way. *Training and Development*, *46*(7), 52–54.

Parwoll, M., & Wagner, R. (2012). *The Impact of Missing Values on PLS Model Fitting*. https://doi.org/10.1007/978-3-642-24466-7_55

Pattansheti, M., Kamble, S. S., Dhume, S. M., & Raut, R. D. (2016). Development, measurement and validation of an integrated technology readiness acceptance and planned behaviour model for Indian mobile banking industry. *International Journal of Business Information Systems*, *22*(3), 316–342. https://doi.org/10.1504/IJBIS.2016.076875

Peracchio, L. A., & Tybout, A. M. (1996). The Moderating Role of Prior Knowledge in Schema-Based Product Evaluation. *Journal of Consumer Research*, *23*(3), 177. https://doi.org/10.1086/209476

Perry, P., Kent, A., & Bonetti, F. (2018). The Use of Mobile Technologies in Physical Stores: The Case of Fashion Retailing. *Exploring Omnichannel Retailing*, 169–195. https://doi.org/10.1007/978-3-319-98273-1_8

Peterson, R. A., & Kim, Y. (2013). On the relationship between coefficient alpha and composite reliability. *The Journal of Applied Psychology*, *98*(1), 194–198. https://doi.org/10.1037/a0030767

Pew Research Center. (2018). Defining generations: Where Millennials end and post-Millennials begin.

Pew Research Center. (2019). Defining generations: Where Millennials end and Generation Z begins.

Pikri, E. (2018). How Malaysia Measures Up To Southeast Asia's Payments Landscape.

Pikri, E. (2019). How Cashless is Malaysia Right Now?

Pillay, S., & Samudin, N. (2018). M40's want more tax incentives and relief from new Budget.

Piriyakul, M., Piriyakul, R., Chuachareon, O., Boonyoung, M., Piriyakul, P., & Piriyakul, I. (2015). *Effects of Trust, Satisfaction and Factors Corresponding to TAM on Intention to Reuse Internet Business Transaction*.

Pirker, C. (2009). *Statistical Noise or Valuable Information*. https://doi.org/10.1007/978-3-8349-8376-3

PM Securities. (2015). Cheque Processing Fee. *PM Securities*, p. 2710. Retrieved from http://www.pmsecurities.com.my/images/cheque-charges2.pdf

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*(3), 879–891. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/18697684

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. *Multivariate Behavioral Research*, *42*(1), 185–227. https://doi.org/10.1080/00273170701341316

Priya, R., Gandhi, A. V., & Shaikh, A. (2018). Mobile banking: consumer perception towards adoption. *Benchmarking: An International Journal*, *Vol. 23*(Issue 7), 1–43. https://doi.org/10.1108/BIJ-01-2016-0009

PwC. (2012a). Millennials at work Reshaping the workforce. In *PwC*. https://doi.org/10.1007/978-3-319-25735-8

PwC. (2012b). *Millennials at work Reshaping the workforce choosing an employer Malaysian millenn*. Retrieved from https://www.pwc.com/my/en/assets/publications/millennials-at-work.pdf

QRCode. (2019). QR Code Basics.

Rahi, S., & Ghani, M. (2018). The role of UTAUT, DOI, perceived technology security and game elements in internet banking adoption. *World Journal of Science, Technology and Sustainable Development*, *15*(4), 338–356. https://doi.org/10.1108/wjstsd-05-2018-0040

Rahi, S., Ghani, M., Alnaser, F. M., & Ngah, A. H. (2018). Investigating the role of unified theory of acceptance and use of technology (UTAUT) in internet banking adoption context. *Management Science Letters*, *8*, 173–186. https://doi.org/10.5267/j.msl.2018.1.001

Raina, V. K. (2014). Overview of Mobile Payment. In *Banking, Finance, and Accounting* (pp. 180–217). https://doi.org/10.4018/978-1-4666-6268-1.ch011

Raj, A. P. (2014). Digital Banking to Advance More Rapidly in Malaysia. *The Edge Malaysia*, p. 27.

Raja, J. (2008). *E-payments: Problems and Prospects*.

Rajalahti, T., & Kvalheim, O. M. (2011). Multivariate data analysis in pharmaceutics: A tutorial review. *International Journal of Pharmaceutics*, *417*(1–2), 280–290. https://doi.org/10.1016/j.ijpharm.2011.02.019

Ramayah, T., Chiun, L. M., Rouibah, K., & May, O. S. (2014). Identifying Priority Using an Importance-Performance Matrix Analysis (IPMA). *International Journal of E-Adoption*, *6*(1), 1–15. https://doi.org/10.4018/ijea.2014010101

Ramayah, T., Lee, J. W. C., & In, J. B. C. (2011). Network collaboration and performance in the tourism sector. *Service Business*, *5*(4), 411–428. https://doi.org/10.1007/s11628-011-0120-z

Rana, N. P., Dwivedi, Y. K., Williams, M. D., & Weerakkody, V. (2016). Computers in Human Behavior Adoption of online public grievance redressal system in India : Toward developing a uni fi ed view. *Computers in Human Behavior*, *59*, 265–282. https://doi.org/10.1016/j.chb.2016.02.019

Rao, A. R., & Monroe, K. B. (1988). The Moderating Effect of Prior Knowledge on Cue Utilization in Product Evaluations. *Journal of Consumer Research*, *15*(2), 253. https://doi.org/10.1086/209162

Ratten, V. (2013). Cloud computing: A social cognitive perspective of ethics, entrepreneurship, technology marketing, computer self-efficacy and outcome expectancy on behavioural intentions. *Australasian Marketing Journal (AMJ)*, *21*(3), 137–146. https://doi.org/10.1016/j.ausmj.2013.02.008

Raykov, T. (1998). Coefficient Alpha and Composite Reliability With Interrelated Nonhomogeneous Items. *Applied Psychological Measurement*, *22*(4), 375–385. https://doi.org/10.1177/014662169802200407

Raza, S. A., Shah, N., & Ali, M. (2018). Acceptance of mobile banking in Islamic banks: evidence from modified UTAUT model. *Journal of Islamic Marketing*, JIMA-04-2017-0038. https://doi.org/10.1108/JIMA-04-2017-0038

Reinartz, W., Haenlein, M., & Henseler, J. (2009). An empirical comparison of the efficacy of covariance-based and varianced-based SEM. *International Journal of Research in Marketing*, *26*(1), 332–344.

Reunis, M. R. B., Santema, S. C., & Harink, J. H. A. (2006). Increasing e-ordering adoption: A case study. *Journal of Purchasing and Supply Management*, *12*(6), 322–331. https://doi.org/10.1016/j.pursup.2007.01.006

Rigdon, E. E., Schumacker, R. E., & Wothke, W. (1998). A comparative review of interaction and nonlinear modeling. In *Interaction and nonlinear effects in structural equation modeling* (R. E. Schu). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.

Ringle, C. M., Wende, S., & Will, A. (2010). Finite Mixture Partial Least Squares Analysis: Methodology and Numerical Examples. In *Handbook of Partial Least Squares* (pp. 195–218). https://doi.org/10.1007/978-3-540-32827-8_9

Riquelme, H. E., & Rios, R. E. (2010). The moderating effect of gender in the adoption of mobile banking. *International Journal of Bank Marketing*, *28*(5), 328–341. https://doi.org/10.1108/02652321011064872

Roach, A. (2019). Ecommerce Roadmap: How To Start A Successful Ecommerce Business.

Rodrigo, S. K. A. (2016). Working for welfare: Inequality and shared vulnerability among the Malaysian middle classes. *Malaysian Journal of Economic Studies*, *53*(1), 9–31.

Rogers, E. M. (1995). *Diffusion of Innovations* (Fourth). New York, NY: The Free Press.

Rogers, Everett M. (1983). Diffusion of innovations. In *Newyork Free Press*. https://doi.org/citeulike-article-id:126680

Rojas-Méndez, J. I., Parasuraman, A., & Papadopoulos, N. (2017). Demographics, attitudes, and technology readiness. *Marketing Intelligence & Planning*, *35*(1), 18–39. https://doi.org/10.1108/MIP-08-2015-0163

Ross, I., & Bettman, J. R. (1979). An Information Processing Theory of Consumer Choice. *Journal of Marketing*, *43*(3), 124. https://doi.org/10.2307/1250155

Rouse, M. (2019). e-commerce (electronic commerce or EC).

Rusuli S, C. M. (2013). Factor Retention Decisions in Exploratory Factor Analysis Results: A Study Type of Knowledge Management Process at Malaysian University Libraries. *Asian Social Science*, *9*(15). https://doi.org/10.5539/ass.v9n15p227

Saeed, K. A. (2011). Understanding the Adoption of Mobile Banking Services : An Empirical Assessment. *AMCIS 2011 Proceedings-All Submissions. Paper 5*. Retrieved from http://aisel.aisnet.org/amcis2011_submissions/5/

Salloum, S. A. (2019). *Proceedings of the International Conference on Advanced Intelligent Systems and Informatics 2018* (A. E. Hassanien, M. F. Tolba, K. Shaalan, & A. T. Azar, Eds.). https://doi.org/10.1007/978-3-319-99010-1

Saunders, M., Lewis, P., & Thornhill, A. (2008). Research Methods for Business Students. In *Research methods for business students* (7th ed.). Pearson Education Limited.

Sawant, A. (2019). E-wallet Market 2019 Global Industry Size, share, Growth, Emerging Technologies, Key Country Analysis, Opportunities and Regional Forecast to 2023.

Schaefer, D. R., & Dillman, D. A. (1998). Development of a standard e-mail methodology: Results of an experiment. *Public Opinion Quarterly*, *62*(3), 378–397.

Schaupp, L. C., Carter, L., & McBride, M. E. (2010). E-file adoption: A study of U.S. taxpayers' intentions. *Computers in Human Behavior*, *26*(4), 636–644. https://doi.org/10.1016/j.chb.2009.12.017

Schierz, P. G., Schilke, O., & Wirtz, B. W. (2010). Understanding consumer acceptance of mobile payment services: An empirical analysis. *Electronic Commerce Research and Applications*, *9*(3), 209–216. https://doi.org/10.1016/j.elerap.2009.07.005

Sekaran, U., & Bougie, R. (2013). *Research Methods for Business: A Skill-Building Approach* (6th ed.; 4, Ed.). New York: John Willey & Sons Ltd.

Sekaran, Uma, & Bougie, R. (2010). Research Methods for Business : A Skill Building Approach. In *John Wiley & Sons* (5th ed.). UK: John Wiley & Sons.

Sekyere Mbrokoh, A. (2016). Journal of Internet Banking and Commerce Exploring the Factors that Influence the Adoption of Internet Banking in Ghana. *Journal of Internet Banking and Commerce*, *21*(212).

Seol, S., Ko, D., & Yeo, I. (2017). UX Analysis based on TR and UTAUT of Sports Smart Wearable Devices. *KSII Transactions on Internet and Information Systems*, *11*(8), 4162–4179. https://doi.org/10.3837/tiis.2017.08.024

Shahriar, A., & Hani, U. (2011). Complex modeling in marketing using component based SEM. *Australian and New Zealand Marketing Academy Conference (ANZMAC2011)*, 1–9.

Shaikh, A. A., & Karjaluoto, H. (2014). Mobile banking adoption: A literature review. *Telematics and Informatics*, *32*(1), 129–142. https://doi.org/10.1016/j.tele.2014.05.003

Shaikh, A. A., & Karjaluoto, H. (2015). Consumers' perceptions of mobile banking continuous usage in Finland and South Africa. *International Journal of Electronic Finance*, *8*(2–4), 149–168. https://doi.org/10.1504/IJEF.2015.070528

Shanmugam, A., Savarimuthu, M. T., & Wen, T. C. (2014). Factors affecting Malaysian behavioral intention to use mobile banking with mediating effects of attitude. *Academic Research International*, *5*(2), 236–253.

Sharma, S. K. (2017). Integrating cognitive antecedents into TAM to explain mobile banking behavioral intention: A SEM-neural network modeling. *Information Systems Frontiers*, (Zhou 2011), 1–13. https://doi.org/10.1007/s10796-017-9775-x

Sharon, A. (2019). Malaysia expected to become cashless society in 20 years.

Shaw, N., & Sergueeva, K. (2019). The non-monetary benefits of mobile commerce: Extending UTAUT2 with perceived value. *International Journal of Information Management*, *45*(October 2018), 44–55. https://doi.org/10.1016/j.ijinfomgt.2018.10.024

Shen, O. C. (2017). Are Malaysians Between 25-35 Years Old Financially Screwed?

Sheppard, B. H., Hartwick, J., & Warshaw, P. R. (1988). The Theory of Reasoned Action: A Meta-Analysis of Past Research with Recommendations for Modifications and Future Research. *The Journal of Consumer Research*, *15*(3), 325–343. Retrieved from http://links.jstor.org/sici?sici=0093-5301%28198812%2915%3A3%3C325%3ATTORAA%3E2.0.CO%3B2-9

Shih, Y.-Y., & Fang, K. (2006). Effects of network quality attributes on customer adoption intentions of Internet Banking. *Total Quality Management & Business Excellence*, *17*(1), 61–77. https://doi.org/10.1080/14783360500249661

Shin, S., & Lee, W. J. (2014). The effects of technology readiness and technology acceptance on NFC mobile payment services in Korea. *Journal of Applied Business Research*, *30*(6), 1615–1626.

Singeh, F. W., Abrizah, A., & Karim, N. H. A. (2013). Malaysian authors' acceptance to self-archive in institutional repositories. *The Electronic Library*, *31*(2), 188–207. https://doi.org/10.1108/02640471311312375

Singh, N., Srivastava, S., & Sinha, N. (2017). Consumer preference and satisfaction of M-wallets: a study on North Indian consumers. *International Journal of Bank Marketing*, *35*(6), 944–965. https://doi.org/10.1108/IJBM-06-2016-0086

Singh, R. (2018). Broadband prices to drop by 25% by end of the year.

Singh, S., & Srivastava, R. K. (2018). Predicting the intention to use mobile banking in India. *International Journal of Bank Marketing*, *36*(2), 357–378. https://doi.org/10.1108/IJBM-12-2016-0186

Sinha, M., Majra, H., Hutchins, J., & Saxena, R. (2018). Mobile payments in India: the privacy factor. *International Journal of Bank Marketing*, IJBM-05-2017-0099. https://doi.org/10.1108/IJBM-05-2017-0099

Siu, N. Y. M., & Chang, L. M. K. (2015). A Study of Service Quality, Perceived Risk and Personal Innovativeness in Internet Banking. In *Revolution in Marketing: Market Driving Changes* (pp. 78–83). https://doi.org/10.1007/978-3-319-11761-4_36

Siyal, A. W., Ding, D., & Siyal, S. (2019). M-banking barriers in Pakistan: a customer perspective of adoption and continuity intention. *Data Technologies and Applications*, DTA-04-2018-0022. https://doi.org/10.1108/DTA-04-2018-0022

Smutkupt, P., Krairit, D., & Esichaikul, V. (2010). Mobile Marketing : Implications for MARKETING STRATEGIES. *International Journal of Mobile Marketing*, *5*(2), 126–139. Retrieved from http://web.efzg.hr/dok/MAR/vskare/kolegiji/im/materijali/Mobile_Marketing-Implications_for_Marketing_Strategies.pdf%5Cnhttp://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=61262769&site=ehost-live

Snow, C. C., & Thomas, J. B. (1994). Field Research Methods in Strategic Management: Contributions to Theory Building and Testing. *Journal of Management Studies*, *31*(4), 457–480. https://doi.org/10.1111/j.1467-6486.1994.tb00626.x

Son, M., & Han, K. (2011). Beyond the technology adoption: Technology readiness effects on post-adoption behavior. *Journal of Business Research*, *64*(11), 1178–1182. https://doi.org/10.1016/j.jbusres.2011.06.019

Sophonthummapharn, K., & Tesar, G. (2007). Technology Readiness and Propensity of Cell Phone Users to Subscribe to Commercial Messaging Services. In *Marketing Management Journal* (Vol. 17).

Sorensen, E. (2018). Different types of mobile payments explained.

Stazzone, S. (2019). Guide to Barcodes vs. QR Codes: In-Depth Comparison and Analysis of Both Label Types.

Stei, G., & Rossmann, A. (2017). Implementation Strategies for Enterprise Social Networks. *Implementation Strategies for Enterprise Social Networks*, 67–78.

Steiger, J. (2013). *An Examination of the Influence of Organizational Structure Types and Management Levels on Knowledge Management Practices in Organizations Dissertation Presented to the Graduate Faculty of the Alliant School of Management Alliant International University*.

Straub, D., & Burton-Jones, A. (2007). Veni, vidi, vici: Breaking the TAM logjam. In *J. AIS* (Vol. 8).

Sudha, N., & S., B. (2011). Evolution of new WARM using Likert Weight Measures (LWM). *IJCSNS International Journal of Computer Science and Network Security*, *11*(5), 70–75.

Sudman, N. M. B. S., & Wansink, B. (2004). *Asking Questions: The Definitive Guide to Questionnaire Design -- For Market Research, Political Polls, and Social and Health Questionnaires, Revised Edition*. San Francisco, CA: Jossey Bass Wiley.

Suki, N. M., & Suki, N. M. (2017). Determining students' behavioural intention to use animation and storytelling applying the UTAUT model: The moderating roles of gender and experience level. *The International Journal of Management Education*, *15*(3), 528–538. https://doi.org/https://doi.org/10.1016/j.ijme.2017.10.002

Sultan, S. A. M. (2018). The 5 trends that will shape Islamic finance in 2018.

Sumathy, M., & KP, V. (2017). Digital payment systems: Perception and concerns among urban consumers. *International Journal of Appl Ied Research*, *3*(6), 1118–1122.

Sun, Y., Bhattacherjee, A., & Ma, Q. (2009). Extending technology usage to work settings: The role of perceived work compatibility in ERP implementation. *Information & Management*, *46*(6), 351–356. https://doi.org/10.1016/j.im.2009.06.003

Surendra, E. (2017). What Does It Mean To Be Middle Class In Malaysia In 2017.

Susanto, A., Chang, Y., & Ha, Y. (2016). Determinants of continuance intention to use the smartphone banking services. *Industrial Management & Data Systems*, *116*(3), 508–525. https://doi.org/10.1108/IMDS-05-2015-0195

Susanto, A., Lee, H., Zo, H., & Ciganek, A. P. (2013). User acceptance of Internet banking in Indonesia: initial trust formation. *Information Development*, *29*(4), 309–322. https://doi.org/10.1177/0266666912467449

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics*. Pearson Education.

Taghiloo, M., Ali Agheli, M., & Rezaeinezhad, M. R. (2010). Mobile Based Secure Digital Wallet for Peer to Peer Payment System. *International Journal of UbiComp*, *1*(4), 1–11. https://doi.org/10.5121/iju.2010.1401

Tam, C., & Oliveira, T. (2016). Computers in Human Behavior Understanding the impact of m-banking on individual performance : DeLone & McLean and TTF perspective. *Computers in Human Behavior*, *61*, 233–244. https://doi.org/10.1016/j.chb.2016.03.016

Tan. (2018). E-wallet race heats up.

Tan, E., & Lau, J. (2016). Behavioural intention to adopt mobile banking among the millennial generation Article information : *Young Consumers*, *17*(1). https://doi.org/10.1108/YC-07-2015-00537

Tan, K.-C., Kannan, V. R., Handfield, R. B., & Ghosh, S. (1999). Supply chain management: an empirical study of its impact on performance. *International Journal of Operations & Production Management*, *19*(10), 1034–1052. https://doi.org/10.1108/01443579910287064

Tan, K. S., Chong, S. C., Loh, P. L., & Lin, B. (2010). An evaluation of e-banking and m-banking adoption factors and preference in Malaysia: a case study. *International Journal of Mobile Communications*, *8*(5), 507. https://doi.org/10.1504/IJMC.2010.034935

Tarhini, A., El-Masri, M., Ali, M., & Serrano, A. (2016). Extending the UTAUT model to understand the customers' acceptance and use of internet banking in Lebanon. *Information Technology & People*, *29*(4), 830–849. https://doi.org/10.1108/ITP-02-2014-0034

Tariq, Q. (2018). Banks waive fee for Instant Interbank Fund Transfer (Update).

Taylor, S., & Todd, P. (1995). Assessing IT Usage : The Role of Prior Experience The Influence of Prior Experience. *Management Information Systems*, *19*(December), 561–570.

Teijlingen, E. R. Van, Rennie, A.-M., Hundley, V., & Graham, W. (2001). The importance of conducting and reporting pilot studies: the example of the Scottish Births Survey. *Journal of Advanced Nursing*, *34*(3), 289–295. https://doi.org/10.1046/j.1365-2648.2001.01757.x

Temme, D., Kreis, H., & Hildebrandt, L. (2006). PLS Path Modeling – A Software Review. In *Institute of Marketing*. Berlin: Humboldt-Universität zu Berlin.

Temme, D., Kreis, H., & Hildebrandt, L. (2010). A Comparison of Current PLS Path Modeling Software: Features, Ease-of-Use, and Performance. In *Handbook of Partial Least Squares* (pp. 737–756). https://doi.org/10.1007/978-3-540-32827-8_32

Tenenhaus, M., Vinzi, V. E., Chatelin, Y.-M., & Lauro, C. (2005). PLS path modeling. *Computational Statistics & Data Analysis*, *48*(1), 159–205. https://doi.org/10.1016/j.csda.2004.03.005

Teo, A.-C., Tan, G. W.-H., Ooi, K.-B., Hew, T.-S., & Yew, K.-T. (2015). The effects of convenience and speed in m-payment. *Industrial Management & Data Systems*, *115*(2), 311–331. https://doi.org/10.1108/IMDS-08-2014-0231

Thakur, R., & Srivastava, M. (2014). Adoption readiness, personal innovativeness, perceived risk and usage intention across customer groups for mobile payment services in India. *Internet Research*, *24*(3), 369–392. https://doi.org/10.1108/IntR-12-2012-0244

The Media Insight Project. (2015). *Breaking Down the Millennial Generation: A Typology of Young News Consumers*. Chicago: The American Press Institute (API.

The Star Online. (2013, October). Deputy Finance Minister: 14.6m Internet banking subscribers in Malaysia. *TheStar*. Retrieved from http://www.thestar.com.my/business/business-news/2013/10/02/deputy-finance-minister-internet-banking-subscribers-in-malaysia/

The Star Online. (2015). Najib: Country needs M40 to spur economy.

The Star Online. (2017a). Malaysia moving towards cashless society.

The Star Online. (2017b). Malaysia to formulate attractive package for Digital Free Trade Zone: Najib.

The Star Online. (2017c). Maybank launches cashless mobile payment option using QR codes.

The Statistics Portal. (2019). eCommerce.

The World Bank. (2019). Mobile cellular subscriptions (per 100 people).

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal Computing: Toward a Conceptual Model of Utilization. *MIS Quarterly*, *15*(1), 125. https://doi.org/10.2307/249443

Thongsri, N., Shen, L., Bao, Y., & Alharbi, I. M. (2018). Integrating UTAUT and UGT to explain behavioural intention to use M-learning. *Journal of Systems and Information Technology*, *20*(3), 278–297. https://doi.org/10.1108/jsit-11-2017-0107

Tobbin, P. (2012). Towards a model of adoption in mobile banking by the unbanked: a qualitative study. *Info*, *14*(5), 74–88. https://doi.org/10.1108/14636691211256313

Toksoz, T., & Price, T. (2017). *Payment Card Offers And Selection Based On Benefits Offered If Applied To Present Transactions*.

Tornatzky, L. G., & Klein, K. J. (1982). Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. *IEEE Transactions on Engineering Management*, *EM-29*(1), 28–45. https://doi.org/10.1109/TEM.1982.6447463

Triandis, H C. (1980). Values, attitudes, and interpersonal behavior. *Nebraska Symposium on Motivation. Nebraska Symposium on Motivation*, *27*, 195–259. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/7242748

Triandis, Harry Charalambos. (1977). *Interpersonal behavior*. Brooks/Cole Pub. Co.

Tseng, J., & Fan, Y. (2017). The Influence of Intention to Use the Mobile Banking - The Privacy Mechanism Perspective. *Journal of Management Research*, *9*(1). https://doi.org/10.5296/jmr.v9i1.10580

Tsikriktsis, N. (2004). A Technology Readiness-Based Taxonomy of Customers. *Journal of Service Research*, *7*(1), 42–52. https://doi.org/10.1177/1094670504266132

U, A., & C, T. (2016). Mobile Use and Online Preferences of the Millenials: A Study in Yalova. *The Journal of Internet Banking and Commerce*, *21*(1), 1–12.

Union Bank. (2019). Online Banking/Bill Pay.

Valentine, D. B., & Powers, T. L. (2013). ONLINE PRODUCT SEARCH AND PURCHASE BEHAVIOR OF GENERATION Y. *Atlantic Marketing Journal*, *2*(1). Retrieved from http://digitalcommons.kennesaw.edu/amj

Valentine, D., & Powers, T. (2013). Generation Y values and lifestyle segments. *Journal of Consumer Marketing*, *30*(7), 597–606. https://doi.org/10.1108/JCM-07-2013-0650

Valentine, L. (2014, November). What Generation Y really wants: Majority look to banks for help. *Banking Exchange*.

Vallerand, R. J. (1997). *Toward A Hierarchical Model of Intrinsic and Extrinsic Motivation*. https://doi.org/10.1016/S0065-2601(08)60019-2

Van Der Boor, P., Oliveira, P., & Veloso, F. (2014). Users as innovators in developing countries: The global sources of innovation and diffusion in mobile banking services. *Research Policy*, *43*(9), 1594–1607. https://doi.org/10.1016/j.respol.2014.05.003

Vasileiadis, A. (2014). Security Concerns and Trust in the Adoption of M-Commerce. *Social Technologies*, *4*(1), 179–191. https://doi.org/10.13165/ST-14-4-1-12

Venkatesh, Viswanath., Thong, James, Y.L. & Xu, X. (2012). Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology. *MIS Quarterly*, *36*(1), 157–178. https://doi.org/10.1111/j.1540-4560.1981.tb02627.x

Venkatesh, S., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decis Sci*, *39*(2). https://doi.org/10.1111/j.1540-5915.2008.00192.x

Venkatesh, V., & Brown, S. A. (2001). A Longitudinal Investigation of Personal Computers in Homes: Adoption Determinants and Emerging Challenges. *MIS Quarterly*, *25*(1), 71. https://doi.org/10.2307/3250959

Venkatesh, V., Brown, S., Maruping, L., & Bala, H. (2008). Predicting Different Conceptualizations of System Use: The Competing Roles of Behavioral Intention, Facilitating Conditions, and Behavioral Expectation. *Management Information Systems Quarterly*, *32*(3). Retrieved from https://aisel.aisnet.org/misq/vol32/iss3/4

Venkatesh, V., & Davis, F. D. (1996). A Model of the Antecedents of Perceived Ease of Use: Development and Test. *Decision Sciences*, *27*(3), 451–481. https://doi.org/10.1111/j.1540-5915.1996.tb00860.x

Venkatesh, V., & Davis, F. D. (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Studies. *Management Science*, *46*(2), 186–205. https://doi.org/10.1287/mnsc.46.2.186.11926

Venkatesh, V., Davis, F., & Morris, M. (2007). Dead Or Alive? The Development, Trajectory And Future Of Technology Adoption Research. *Journal of the Association for Information Systems*, *8*(4), 267–286. https://doi.org/10.17705/1jais.00120

Venkatesh, V., Morris, M. G. ., Davis, G. B. ., Davis, F. D. ., Venkatesh, V., Morris, M. G., … Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, *27*(3), 425–478. https://doi.org/10.2307/30036540

Venkatesh, V., & Speier, C. (1999). Computer Technology Training in the Workplace: A Longitudinal Investigation of the Effect of Mood. *Organizational Behavior and Human Decision Processes*, *79*(1), 1–28. https://doi.org/10.1006/obhd.1999.2837

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2016). Unified Theory of Acceptance and Use of Technology: A Synthesis and the Road Ahead. *Journal of the Association for Information Systems*, *17*(5), 328–376.

Veríssimo, J. M. C. (2016). Enablers and restrictors of mobile banking app use: A fuzzy set qualitative comparative analysis (fsQCA). *Journal of Business Research*, (Article in press). https://doi.org/10.1016/j.jbusres.2016.04.155

Vinzi, V. E., Chin, W. W., Henseler, J., & Wang, H. (2010). *Handbook of Partial Least Squares* (V. Esposito Vinzi, Chin, J. Henseler, & H. Wang, Eds.). https://doi.org/10.1007/978-3-540-32827-8

Vitex. (2017). Mobile Banking and Mobile Wallets – What's the difference?

Walczuch, R., Lemmink, J., & Streukens, S. (2007). The effect of service employees' technology readiness on technology acceptance. *Information & Management*, *44*(2), 206–215. https://doi.org/10.1016/j.im.2006.12.005

Wang, S. (2017). Why China can't get enough of QR codes.

Warner, R. M. (2013). *Applied statistics : from bivariate through multivariate techniques* (2nd ed.). Retrieved from https://us.sagepub.com/en-us/nam/applied-statistics/book235443#preview

We are Social, H. (2018). *Digital in 2018 in Southeast Asia*.

We Are Social, H. (2017). *Digital in 2017 : Southeast Asia*.

Weisberg, Herbert F. Krosnick, J. A., & Bowen, B. D. (1989). *An introduction to survey research and data analysis* (2nd ed.). Glenview.

Wetzels, M., Odekerken-Schroder, G., & Oppen, C. van. (2009). Using PLS Path Modeling for Assessing Hierarchical Construct Models: Guidelines and Empirical Illustration. *Management Information Systems Quarterly*, *33*(1). Retrieved from http://aisel.aisnet.org/misq/vol33/iss1/11

Williams, M., Rana, N., & Dwived, Y. (2015). The unified theory of acceptance and use of technology (UTAUT): a literature review. In *Journal of Enterprise Information Management* (Vol. 28). https://doi.org/10.1108/JEIM-09-2014-0088

Wilson, P. M., Petticrew, M., Calnan, M. W., & Nazareth, I. (2010). Disseminating research findings: what should researchers do? A systematic scoping review of conceptual frameworks. *Implementation Science*, *5*(1), 91. https://doi.org/10.1186/1748-5908-5-91

Wong, A. (2018). Maybank QRPay lets you transfer and receive money on your smartphone.

Wook, M., M. Yusof, Z., & Nazri, M. Z. A. (2014). Data Mining Technology Adoption in Institutions of Higher Learning: A Conceptual Framework Incorporating Technology Readiness Index Model and Technology Acceptance Model 3. *Journal of Applied Sciences*, *14*(18), 2129–2138. https://doi.org/10.3923/jas.2014.2129.2138

Wright, D. B. (1997). *Understanding Statiistics- An Introduction for the Social Sciences*. London: Sage Publication.

Wróbel-Konior, S. (2018). What Is an E-payment System?

Xinhua. (2017). Mobile payment users exceed 520 million in China: Ant Financial.

Yai, L. C. (2018). Pushing wider adoption of e-wallet | Focus Malaysia.

Yeh-Yun Lin, C., Yi-Ching Chen, M., Yeh Yun Lin, C., & Yi Ching Chen, M. (2007). Does innovation lead to performance? An empirical study of SMEs in Taiwan. *Management Research News*, *30*(2), 115–132. https://doi.org/10.1108/01409170710722955

Yen, H. R. (2005). An attribute-based model of quality satisfaction for Internet self-service technology. *The Service Industries Journal*, *25*(5), 641–659. https://doi.org/10.1080/02642060500100833

Yeong, E. (2013, October). Malaysia's internet banking penetration rate at 49.1%. *TheSundaily*. Retrieved from http://www.thesundaily.my/news/846166

Yes Bank. (2019). Digital Banking.

Yi, M. Y., Jackson, J. D., Park, J. S., & Probst, J. C. (2006). Understanding information technology acceptance by individual professionals: Toward an integrative view. *Information & Management*, *43*(3), 350–363. https://doi.org/10.1016/j.im.2005.08.006

Yi, Y., Tung, L. L., & Wu, Z. (2003). Incorporating Technology Readiness (TR) Into TAM: Are Individual Traits Important to Understand Technology Acceptance? *DIGIT 2003 Proceedings*. Retrieved from https://aisel.aisnet.org/digit2003/2

Yoh, E., Damhorst, M. L., Sapp, S., & Laczniak, R. (2003). Consumer adoption of the Internet: The case of apparel shopping. *Psychology and Marketing*, *20*(12), 1095–1118. https://doi.org/10.1002/mar.10110

Yu, C.-S. (2012). Factors Affecting Individuals to Adopt Mobile Banking: Empirical Evidence from the UTAUT Model. *Journal of Electronic Commerce Research*, *13*, 104–121.

Yu, J., Ha, I., Choi, M., & Rho, J. (2005). Extending the TAM for a t-commerce. *Information and Management*, *42*(7), 965–976. https://doi.org/10.1016/j.im.2004.11.001

Yue Chan, K., Gong, M., Xu, Y., & Thong, J. (2008). *Examining user acceptance of SMS: An empirical study in China and Hong Kong.*

Zarmpou, T., Saprikis, V., Markos, A., & Vlachopoulou, M. (2012). Modeling users' acceptance of mobile services. *Electronic Commerce Research*, *12*(2), 225–248. https://doi.org/10.1007/s10660-012-9092-x

Zhang, P. (2017). *Why QR code payment develop well in China ?*

Zhou, T. (2011). An empirical examination of initial trust in mobile banking. *Internet Research*, *21*(5), 527–540. https://doi.org/10.1108/10662241111176353

Zhou, T. (2012a). Examining mobile banking user adoption from the perspectives of trust and flow experience. *Information Technology and Management*, *13*(1), 27–37. https://doi.org/10.1007/s10799-011-0111-8

Zhou, T. (2012b). Understanding users' initial trust in mobile banking: An elaboration likelihood perspective. *Computers in Human Behavior*, *28*(4), 1518–1525. https://doi.org/10.1016/j.chb.2012.03.021

Zhou, T., Lu, Y., & Wang, B. (2010). Integrating TTF and UTAUT to explain mobile banking user adoption. *Computers in Human Behavior*, *26*(4), 760–767. https://doi.org/10.1016/j.chb.2010.01.013

Zhu, D. H., Chang, Y. P., Luo, J. J., & Li, X. (2014). Understanding the adoption of location-based recommendation agents among active users of social networking sites. *Information Processing and Management*, *50*(5), 675–682. https://doi.org/10.1016/j.ipm.2014.04.010

Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2010). *Business Research Methods (8th ed.)*. Canada, South-Western: Cengage Learning.

Zikmund, William G., Babin, B. J., Carr, J. C., & Griffin, M. (2010). *Business Research Methods* (8th ed.). Canada, South-Western: Cengage Learning.

Zou, B., Guo, F., Guo, J., Anderson, C., Zeithaml, C., Barsila, S., … George, G. (2016). Absorptive capacity, technological innovation, and product life cycle: a system dynamics model. *SpringerPlus*, *5*(1), 1662. https://doi.org/10.1186/s40064-016-3328-5

Zuiderwijk, A., Janssen, M., & Dwivedi, Y. K. (2015). Acceptance and use predictors of open data technologies: Drawing upon the unified theory of acceptance and use of technology. *Government Information Quarterly*, *32*(4), 429–440. https://doi.org/10.1016/j.giq.2015.09.005

APPENDICES

Appendix A: Internet Banking and Mobile Banking Subscribers in Malaysia, 2018

Internet Banking and Mobile Banking Subscribers *(end of period)*

Internet Banking

	Number of Subscribers			Penetration to population (%)
million	Total	Individual	Corporate	
2005	2.6	2.5	0.1	9.8
2006	3.2	3.2	0.0	12.0
2007	4.6	4.5	0.1	16.9
2008	6.2	6.1	0.1	22.5
2009	8.1	8.0	0.2	28.9
2010	9.8	9.6	0.2	34.4
2011	11.9	11.6	0.2	40.9
2012	13.7	13.4	0.2	46.4
2013	15.5	15.2	0.3	51.4
2014	17.6	17.3	0.3	57.5
2015	19.8	19.2	0.6	63.3
2016	22.8	22.0	0.8	72.0
2017	25.5	24.6	0.9	79.6
Feb-18	26.2	25.2	1.0	81.8
Mar-15	18.1	17.6	0.4	58.3
Jun-15	18.8	18.3	0.5	60.8
Sep-15	19.5	18.9	0.6	62.8
Dec-15	19.8	19.2	0.6	63.3
Jan-16	20.2	19.6	0.6	63.9
Feb-16	20.5	19.9	0.6	64.6
Mar-16	20.5	19.9	0.6	64.9
Apr-16	20.6	20.0	0.6	65.0
May-16	20.9	20.3	0.6	66.0
Jun-16	20.8	20.2	0.6	65.7
Jul-16	21.3	20.6	0.7	67.2
Aug-16	21.6	21.0	0.7	68.3
Sep-16	22.0	21.3	0.7	69.4
Oct-16	23.1	22.4	0.7	72.9
Nov-16	23.5	22.8	0.7	74.2
Dec-16	22.8	22.0	0.8	72.0
Jan-17	23.2	22.4	0.8	73.1
Feb-17	23.5	22.8	0.8	74.4
Mar-17	24.0	23.2	0.8	75.7
Apr-17	24.3	23.5	0.8	76.9
May-17	24.6	23.7	0.8	77.6
Jun-17	24.9	24.0	0.8	78.5
Jul-17	25.2	24.4	0.9	79.7
Aug-17	25.1	24.2	0.9	79.2
Sep-17	25.2	24.3	0.9	79.5
Oct-17	24.8	23.9	0.9	78.4
Nov-17	25.2	24.2	0.9	79.5
Dec-17	25.5	24.6	0.9	79.6
Jan-18	25.9	24.9	1.0	80.7
Feb-18	26.2	25.2	1.0	81.8

Mobile Banking

	Number of subscribers	Penetration rate (%)	
000		To population	To mobile subscribers
2005	127.6	0.5	0.7
2006	246.7	0.9	1.3
2007	367.6	1.4	1.6
2008	574.6	2.1	2.1
2009	675.0	2.4	2.2
2010	898.5	3.1	2.6
2011	1,560.3	5.3	4.3
2012	2,446.2	8.3	5.9
2013	4,378.8	14.5	10.2
2014	5,639.2	18.4	12.6
2015	7,278.8	23.3	16.5
2016	8,946.2	28.3	20.4
2017	11,480.1	36.3	27.1
Feb-18	12,007.2	37.5	n.a.
Mar-15	6,296.1	20.2	14.2
Jun-15	6,658.4	21.4	15.1
Sep-15	7,001.4	22.5	15.9
Dec-15	7,278.8	23.3	16.5
Jan-16	7,539.2	23.8	n.a.
Feb-16	7,657.4	24.5	n.a.
Mar-16	7,830.8	24.7	17.7
Apr-16	7,954.2	25.1	n.a.
May-16	8,083.3	25.5	n.a.
Jun-16	8,232.6	26.0	18.9
Jul-16	8,377.5	26.5	n.a.
Aug-16	8,574.2	27.1	n.a.
Sep-16	8,763.0	27.7	20.0
Oct-16	8,972.9	28.3	n.a.
Nov-16	9,187.5	29.0	n.a.
Dec-16	8,946.2	28.3	20.4
Jan-17	9,176.2	29.0	n.a.
Feb-17	9,398.8	29.7	n.a.
Mar-17	9,628.3	30.0	22.5
Apr-17	9,864.2	31.2	n.a.
May-17	9,997.7	32.4	n.a.
Jun-17	10,269.5	32.0	24.0
Jul-17	10,453.3	33.0	n.a.
Aug-17	10,678.5	32.0	n.a.
Sep-17	10,827.6	33.8	25.5
Oct-17	11,048.2	34.2	n.a.
Nov-17	11,263.4	35.6	n.a.
Dec-17	11,480.1	36.3	27.1
Jan-18	11,757.0	36.7	n.a.
Feb-18	12,007.2	37.5	n.a.

n.a. Not available

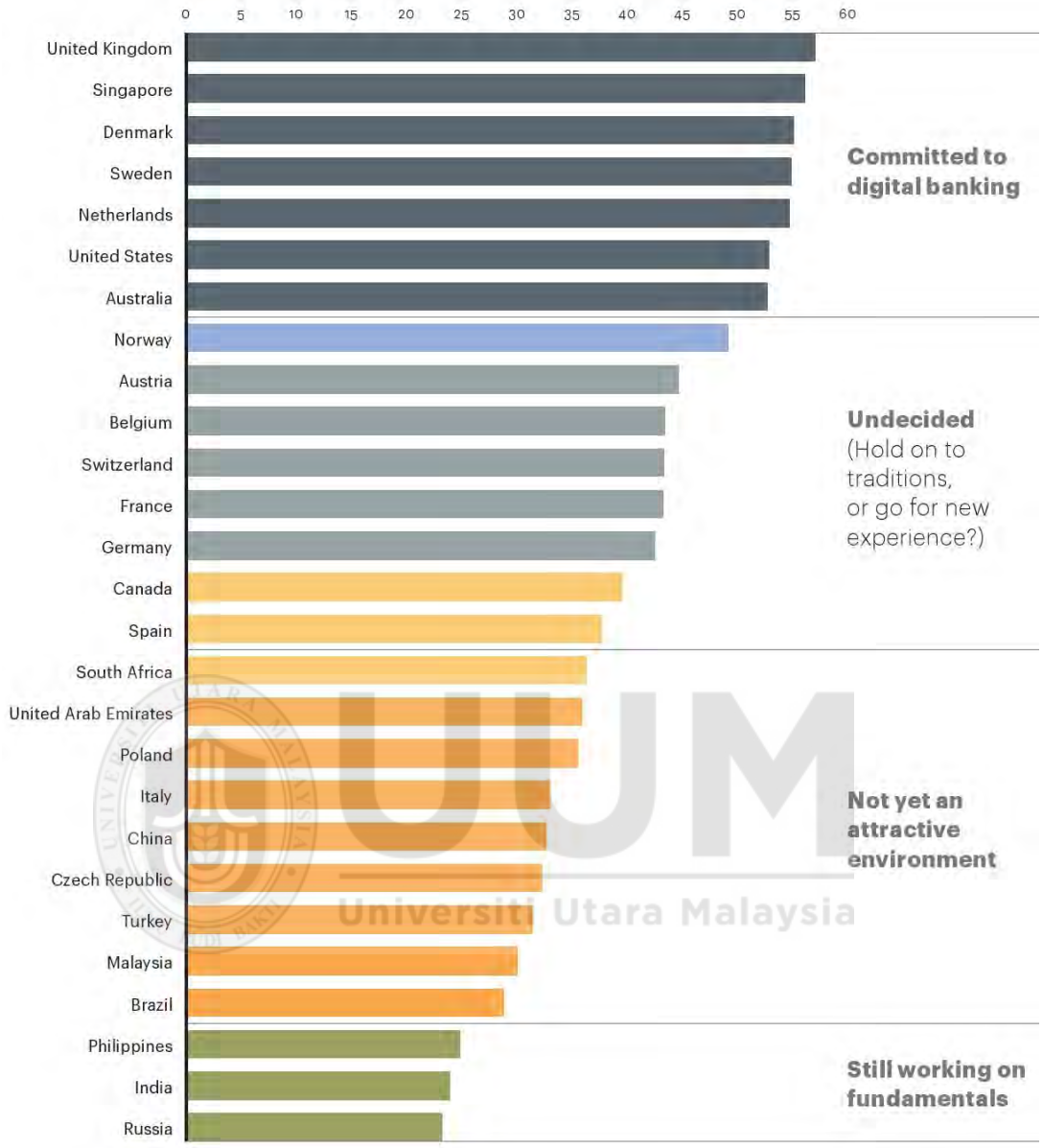
Source: Bank Negara Malaysia (2019b)

Appendix B: List of Internet and Mobile Banking in Malaysia

Internet Banking	Mobile Banking
1. Affin Bank Berhad	1. Al Rajhi Banking & Investment Corporation (Malaysia) Berhad
2. Agrobank	2. Alliance Bank Malaysia Berhad
3. Al Rajhi Banking & Investment Corporation (Malaysia) Berhad	3. AmBank (M) Berhad
4. Alliance Bank Malaysia Berhad	4. Bank Islam Malaysia Berhad
5. AmBank (M) Berhad	5. Bank Muamalat Malaysia Berhad
6. Bank Islam Malaysia Berhad	6. Bank of China (M) Berhad
7. Bank Kerjasama Rakyat Malaysia	7. Bank Simpanan Nasional
8. Bank Muamalat Malaysia Berhad	8. CIMB Bank Berhad
9. Bank of America Malaysia Berhad	9. Citibank Berhad
10. Bank of China (M) Berhad	10. Hong Leong Bank Berhad
11. Bank of Tokyo-Mitsubishi UFJ (Malaysia) Bhd	11. HSBC Bank Malaysia Berhad
12. Bank Simpanan Nasional	12. Industrial and Commercial Bank of China (Malaysia) Berhad
13. BNP Paribas Malaysia Berhad	13. Malayan Banking Berhad
14. China Construction Bank Malaysia Berhad	14. OCBC Bank (Malaysia) Berhad
15. CIMB Bank Berhad	15. Public Bank Berhad
16. Citibank Berhad	16. RHB Bank Berhad
17. Deutsche Bank (Malaysia) Berhad	17. Standard Chartered Bank Malaysia Berhad
18. Hong Leong Bank Berhad	18. United Overseas Bank (Malaysia) Berhad
19. HSBC Bank Malaysia Berhad	
20. Industrial and Commercial Bank of China (Malaysia) Berhad	
21. J.P. Morgan Chase Bank Berhad	
22. Kuwait Finance House (M) Berhad	
23. Malayan Banking Berhad	
24. Mizuho Bank (Malaysia) Berhad	
25. OCBC Bank (Malaysia) Berhad	
26. Public Bank Berhad	
27. RHB Bank Berhad	
28. Standard Chartered Bank Malaysia Berhad	
29. Sumitomo Mitsui Banking Corporation Malaysia Berhad	
30. United Overseas Bank (Malaysia) Berhad	

Source: Bank Negara Malaysia (2019c)

Appendix C: Digital Banking Readiness Index



Source: A.T. Kearney. Inc., (2013)

Appendix D: Survey Questionnaire

THE STATE OF THE ART OF E-WALLET UTILIZATION VIA QR CODE: AN EMPIRICAL STUDY ON RELEVANT PREDICTORS AMONG M40 MILLENNIALS IN MALAYSIA

Dear respected respondent,

Warm greetings. I am a PhD candidate from Universiti Utara Malaysia, and currently conducting a survey on the **utilization of e-wallet transaction via QR code** in Malaysia. From here, I would like to seek your cooperation to fill in this questionnaire. Your willingness to fill in this questionnaire is most appreciated in advance.

E-wallet *is a concept that working with consumer's existing savings and current account. It is an application on the mobile phone and it also scans the merchant's QR code for e-payments to be made.*

Please note that your responses will be treated with the utmost confidentiality and used purely for academic purposes only. I highly appreciate your co-operation.

Thank you for participating and valuable assistance support.

Kindly regards,

……..
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……..
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Opinion on the Behavioural intention to Use E-Wallet Transaction via QR Code.

*Please **TICK (✓)** the most appropriate statement that most suitable to you by using the following scale.*

No	Item	Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
OP1	I think e-wallet transaction via QR code will give me more freedom of mobility.	☐	☐	☐	☐	☐	☐	☐
OP2	I feel that e-wallet transaction via QR code is the newest technology that is much more convenient to use.	☐	☐	☐	☐	☐	☐	☐
OP3	I think e-wallet transaction via QR code will be mentally stimulating.	☐	☐	☐	☐	☐	☐	☐
OP4	I think e-wallet transaction via QR code will allow me to tailor things to fit my own needs.	☐	☐	☐	☐	☐	☐	☐
OP5	I think e-wallet transaction via QR code will make me more efficient in my profession.	☐	☐	☐	☐	☐	☐	☐

No	Item	Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
IN1	I feel that I can figure out e-wallet transaction via QR code without help from others.	☐	☐	☐	☐	☐	☐	☐
IN2	I feel that other people will come to me for advice on e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
IN3	I feel that I will have fewer problems than other people in making e-wallet transaction via QR code work for me.	☐	☐	☐	☐	☐	☐	☐
IN4	I feel that I can keep up with the e-wallet transaction via QR code in my area of interest.	☐	☐	☐	☐	☐	☐	☐
IN5	I think I will be the first in my circle of friends to adopt e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐

No	Item	Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
DI1	I think that e-wallet transaction via QR code is not designed for use by ordinary people.	☐	☐	☐	☐	☐	☐	☐
DI2	I think it is embarrassing when I have trouble with e-wallet transaction via QR code while people are watching.	☐	☐	☐	☐	☐	☐	☐
DI3	I feel that e-wallet transaction via QR code will seem to fail at the worst possible time.	☐	☐	☐	☐	☐	☐	☐
DI4	I think that the instruction of e-wallet transaction via QR code is not easy to understand.	☐	☐	☐	☐	☐	☐	☐
DI5	I feel that e-wallet transaction via QR code has risks that are not discovered until after people have used it.	☐	☐	☐	☐	☐	☐	☐

No	Item	Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
IY1	I feel that e-wallet transaction via QR code is not safe for me to provide my financial information over a mobile phone.	☐	☐	☐	☐	☐	☐	☐
IY2	I think e-wallet transaction via QR code will lower the quality of relationships by reducing personal interaction.	☐	☐	☐	☐	☐	☐	☐
IY3	I think e-wallet transaction via QR code is not safe for me to do any financial transaction online.	☐	☐	☐	☐	☐	☐	☐
IY4	I do not feel confident in doing business with a place that can be reached online including e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
IY5	I think e-wallet transaction via QR code is not safe for me to expose my financial information online.	☐	☐	☐	☐	☐	☐	☐

No	Item	Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
FC1	I think I have the necessary resources to use e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
FC2	I feel that I have the necessary knowledge to use e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
FC3	I think a specified information and support is available in case of difficulty to use e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
FC4	I think using the e-wallet transaction via QR code will fit into my work style.	☐	☐	☐	☐	☐	☐	☐
FC5	I believe that I have enough internet experience to use e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐

No	Item	Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
EE1	I think it is easy for me to understand the e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
EE2	I think it is easy for me to use e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
EE3	I think it is easy for me to learn e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
EE4	I think it is easy for me to become skilful at using e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
EE5	I think my interaction with e-wallet transaction via QR code would be easy for me.	☐	☐	☐	☐	☐	☐	☐

No	Item	Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
PE1	I believe that e-wallet transaction via QR code will be very useful in my life.	☐	☐	☐	☐	☐	☐	☐
PE2	I think using e-wallet transaction via QR code will enable me to accomplish a transaction more quickly.	☐	☐	☐	☐	☐	☐	☐
PE3	I think e-wallet transaction via QR code will enhance my life efficiency.	☐	☐	☐	☐	☐	☐	☐
PE4	I think e-wallet transaction via QR code would enable me to access it anytime when I need it.	☐	☐	☐	☐	☐	☐	☐
PE5	I think e-wallet transaction via QR code could enhance the level of convenience in accessing banking services.	☐	☐	☐	☐	☐	☐	☐

No	Item	Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
SI1	I believe that people in my community will think that I should use e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
SI2	I feel that people who are important to me will think that I should use e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
SI3	I believe that my community will support me to use e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
SI4	I feel that using e-wallet transaction via QR code will enhance my knowledge about the environment.	☐	☐	☐	☐	☐	☐	☐
SI5	I feel that people who use e-wallet transaction via QR code have more prestige.	☐	☐	☐	☐	☐	☐	☐

No	Item	Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
BI1	I think I would like to use e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
BI2	I would feel good about using e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
BI3	I think positively toward using e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
BI4	I think I have the intention to use e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
BI5	I predict that I would use e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
BI6	I plan to use e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
BI7	I guess I intend to be a heavy user of e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
BI8	I think I have the intention to use e-wallet transaction via QR code in the near future.	☐	☐	☐	☐	☐	☐	☐
BI9	I think I am willing to use e-wallet transaction via QR code.	☐	☐	☐	☐	☐	☐	☐
BI10	I guess I will use e-wallet transaction via QR code in regular basic in the near future.	☐	☐	☐	☐	☐	☐	☐

Demographic Profile

Gender	☐ Male ☐ Female
Age Group (years old)	☐ 16 - 21 ☐ 22-37 ☐ 38-53 ☐ 54-72 ☐ Above 73
Household Income Level	☐ Below RM 4,360 ☐ RM 4,360 – RM 9,619 ☐ RM 9,620 and above
Region	☐ North Region (Kedah, Perlis, Pulau Pinang, Perak) ☐ Central Region (Kuala Lumpur, Selangor) ☐ South Region (Negeri Sembilan, Melaka, Johor) ☐ East Coast Region (Pahang, Kelantan, Terengganu) ☐ East Malaysia (Sabah, Sarawak)
Education Level	☐ Diploma ☐ Bachelor's Degree ☐ Master's Degree ☐ PhD ☐ Others : _____
Do you have mobile phone?	☐ Yes ☐ No
Number of Mobile Phone Owned	☐ One ☐ More than one
Years of Mobile Phone Usage	☐ Less than 1 year ☐ 1 - 5 years ☐ 6 - 10 years ☐ More than 10 years
Is your mobile phone Internet-enabled?	☐ Yes ☐ No
Years of Internet Experience	☐ Less than 1 year ☐ 1 - 5 years ☐ 6 - 10 years ☐ More than 10 years
Do you use any of the e-wallet program/ application?	☐ Never use before ☐ If Yes, please state: _____

-THANK YOU VERY MUCH-

Appendix E: Missing Value

Appendix E1: Case Processing Summary (Missing Values) (Before Replace)

Items	N	Mean	Std. Deviation	Missing	
				Count	Percent
OP1	487	5.13	1.349	0	0.0
OP2	487	5.06	1.375	0	0.0
OP3	487	5.10	1.434	0	0.0
OP4	487	4.93	1.524	0	0.0
OP5	486	4.86	1.633	1	.2
IN1	485	4.98	1.588	2	.4
IN2	487	5.00	1.419	0	0.0
IN3	487	4.99	1.429	0	0.0
IN4	487	4.90	1.420	0	0.0
IN5	487	4.96	1.515	0	0.0
DI1	487	4.12	1.120	0	0.0
DI2	485	4.08	1.153	2	.4
DI3	487	4.28	1.135	0	0.0
DI4	487	4.30	1.099	0	0.0
DI5	487	4.31	1.143	0	0.0
IY1	487	4.29	1.456	0	0.0
IY2	487	4.19	1.499	0	0.0
IY3	487	4.33	1.475	0	0.0
IY4	486	4.34	1.481	1	.2
IY5	486	4.54	1.369	1	.2
FC1	487	4.94	1.397	0	0.0
FC2	487	5.04	1.316	0	0.0
FC3	487	4.87	1.412	0	0.0
FC4	487	4.85	1.379	0	0.0
FC5	486	4.83	1.448	1	.2
EE1	487	5.22	1.262	0	0.0
EE2	487	5.17	1.303	0	0.0
EE3	487	5.32	1.226	0	0.0
EE4	487	5.32	1.224	0	0.0
EE5	487	5.28	1.242	0	0.0
PE1	487	5.24	1.315	0	0.0
PE2	486	5.35	1.176	1	.2
PE3	487	5.41	1.060	0	0.0
PE4	487	5.39	1.224	0	0.0
PE5	487	5.41	1.158	0	0.0
SI1	486	5.02	1.373	1	.2
SI2	487	4.99	1.340	0	0.0
SI3	487	4.89	1.451	0	0.0
SI4	487	4.78	1.457	0	0.0
SI5	487	4.70	1.535	0	0.0
BI1	487	5.25	1.295	0	0.0

BI2	487	5.28	1.197	0	0.0
BI3	487	5.34	1.243	0	0.0
BI4	487	5.33	1.147	0	0.0
BI5	486	5.35	1.178	1	.2
BI6	487	5.41	1.085	0	0.0
BI7	486	5.42	1.127	1	.2
BI8	486	5.44	1.132	1	.2
BI9	487	5.33	1.212	0	0.0
BI10	487	5.35	1.193	0	0.0

Appendix E2: Case Processing Summary (Missing Values) (After Replaced)

Items	N	Mean	Std. Deviation	Missing	
				Count	Percent
OP1	487	5.13	1.349	0	0.0
OP2	487	5.06	1.375	0	0.0
OP3	487	5.10	1.434	0	0.0
OP4	487	4.93	1.524	0	0.0
OP5	487	4.86	1.631	0	0.0
IN1	487	4.98	1.584	0	0.0
IN2	487	5.00	1.419	0	0.0
IN3	487	4.99	1.429	0	0.0
IN4	487	4.90	1.420	0	0.0
IN5	487	4.96	1.515	0	0.0
DI1	487	4.12	1.120	0	0.0
DI2	487	4.08	1.151	0	0.0
DI3	487	4.28	1.135	0	0.0
DI4	487	4.30	1.099	0	0.0
DI5	487	4.31	1.143	0	0.0
IY1	487	4.29	1.456	0	0.0
IY2	487	4.19	1.499	0	0.0
IY3	487	4.33	1.475	0	0.0
IY4	487	4.34	1.479	0	0.0
IY5	487	4.54	1.368	0	0.0
FC1	487	4.94	1.397	0	0.0
FC2	487	5.04	1.316	0	0.0
FC3	487	4.87	1.412	0	0.0
FC4	487	4.85	1.379	0	0.0
FC5	487	4.83	1.447	0	0.0
EE1	487	5.22	1.262	0	0.0
EE2	487	5.17	1.303	0	0.0
EE3	487	5.32	1.226	0	0.0
EE4	487	5.32	1.224	0	0.0
EE5	487	5.28	1.242	0	0.0
PE1	487	5.24	1.315	0	0.0
PE2	487	5.35	1.174	0	0.0
PE3	487	5.41	1.060	0	0.0
PE4	487	5.39	1.224	0	0.0
PE5	487	5.41	1.158	0	0.0
SI1	487	5.02	1.372	0	0.0
SI2	487	4.99	1.340	0	0.0
SI3	487	4.89	1.451	0	0.0
SI4	487	4.78	1.457	0	0.0
SI5	487	4.70	1.535	0	0.0
BI1	487	5.25	1.295	0	0.0

BI2	487	5.28	1.197	0	0.0
BI3	487	5.34	1.243	0	0.0
BI4	487	5.33	1.147	0	0.0
BI5	487	5.35	1.177	0	0.0
BI6	487	5.41	1.085	0	0.0
BI7	487	5.42	1.126	0	0.0
BI8	487	5.44	1.131	0	0.0
BI9	487	5.33	1.212	0	0.0
BI10	487	5.35	1.193	0	0.0

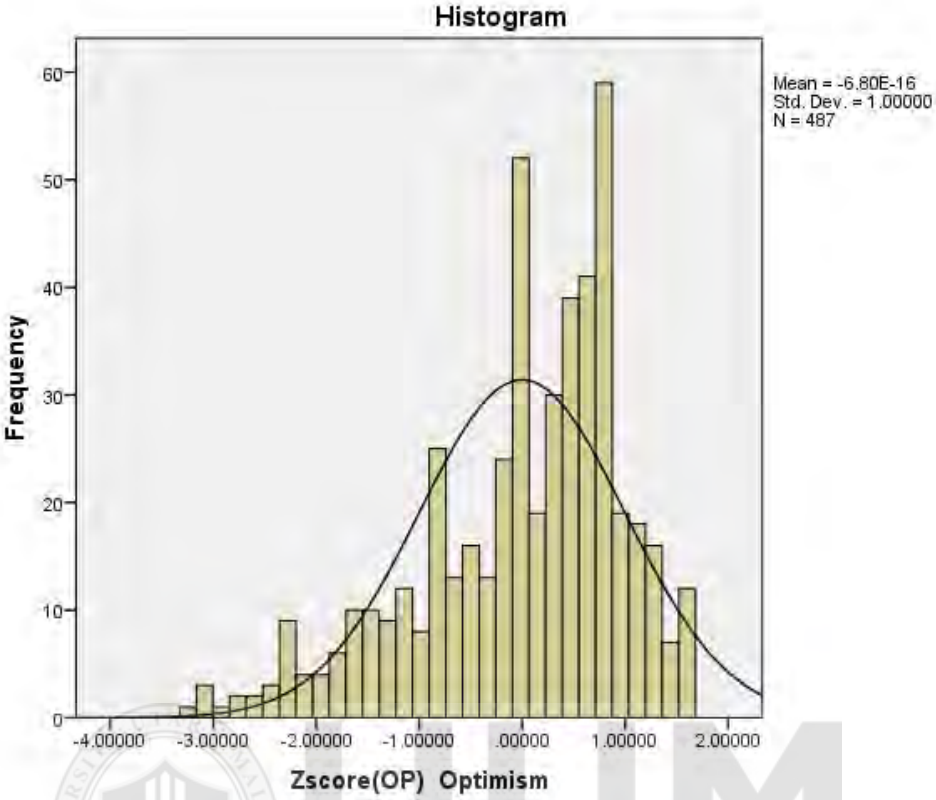
Appendix F: Assessment of Outlier
Appendix F1: Z-score of Measurement Items

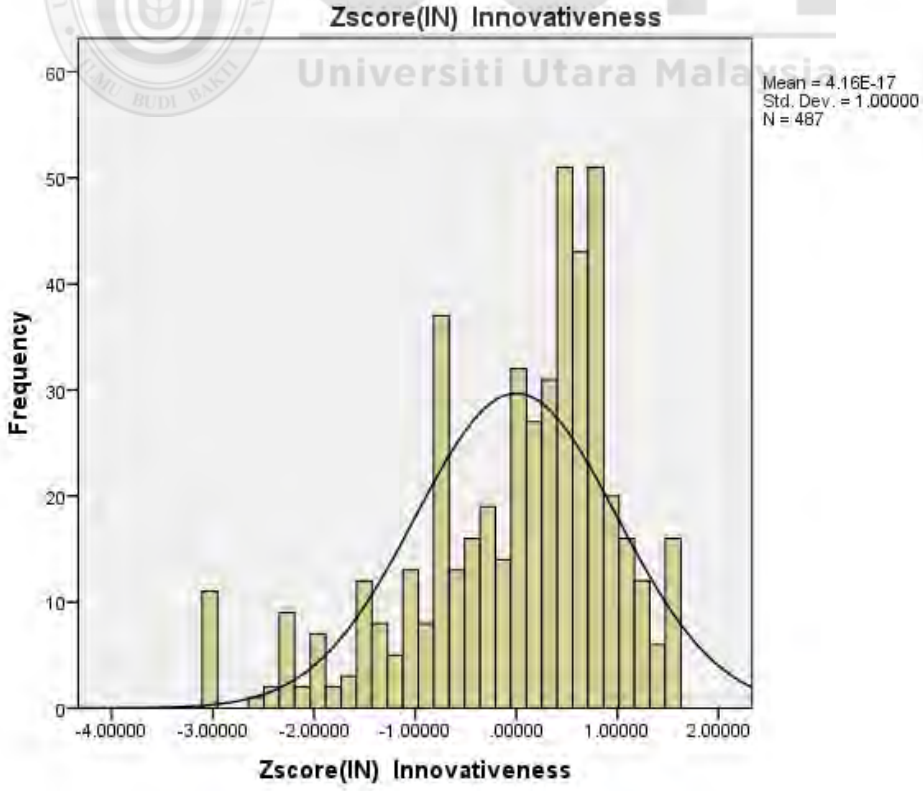
Items	N	Minimum	Maximum
Zscore: OP1 I think e-wallet transaction via QR code will give me more freedom of mobility.	487	-3.06008	1.38845
Zscore: OP2 I feel that e-wallet transaction via QR code is the newest technology that is much more convenient to use.	487	-2.94835	1.41372
Zscore: OP3 I think e-wallet transaction via QR code will be mentally stimulating.	487	-2.85859	1.32408
Zscore: OP4 I think e-wallet transaction via QR code will allow me to tailor things to fit my own needs.	487	-2.58022	1.35680
Zscore: OP5 I think e-wallet transaction via QR code will make me more efficient in my profession.	487	-2.36919	1.30922
Zscore: IN1 I feel that I can figure out e-wallet transaction via QR code without help from others.	487	-2.51440	1.27275
Zscore: IN2 I feel that other people will come to me for advice on e-wallet transaction via QR code.	487	-2.82264	1.40698
Zscore: IN3I feel that I will have fewer problems than other people in making e-wallet transaction via QR code work for me.	487	-2.79125	1.40856
Zscore: IN4 I feel that I can keep up with the e-wallet transaction via QR code in my area of interest.	487	-2.74825	1.47604
Zscore: IN5 I think I will be the first in my circle of friends to adopt e-wallet transaction via QR code.	487	-2.61604	1.34462
Zscore: DI1 I think that e-wallet transaction via QR code is not designed for use by ordinary people.	487	-2.78625	2.56995
Zscore: DI2 I think it is embarrassing when I have trouble with e-wallet transaction via QR code while people are watching.	487	-2.67596	2.53681
Zscore: DI3 I feel that e-wallet transaction via QR code will seem to fail at the worst possible time.	487	-2.88856	2.39990
Zscore: DI4 I think that the instruction of e-wallet transaction via QR code is not easy to understand.	487	-2.99771	2.45980
Zscore: DI5 I feel that e-wallet transaction via QR code has risks that are not discovered until after people have used it.	487	-2.89860	2.35230
Zscore: IY1 I feel that e-wallet transaction via QR code is not safe for me to provide my financial information over a mobile phone.	487	-2.26037	1.85990
Zscore: IY2 I think e-wallet transaction via QR code will lower the quality of relationships by reducing personal interaction.	487	-2.13028	1.87273

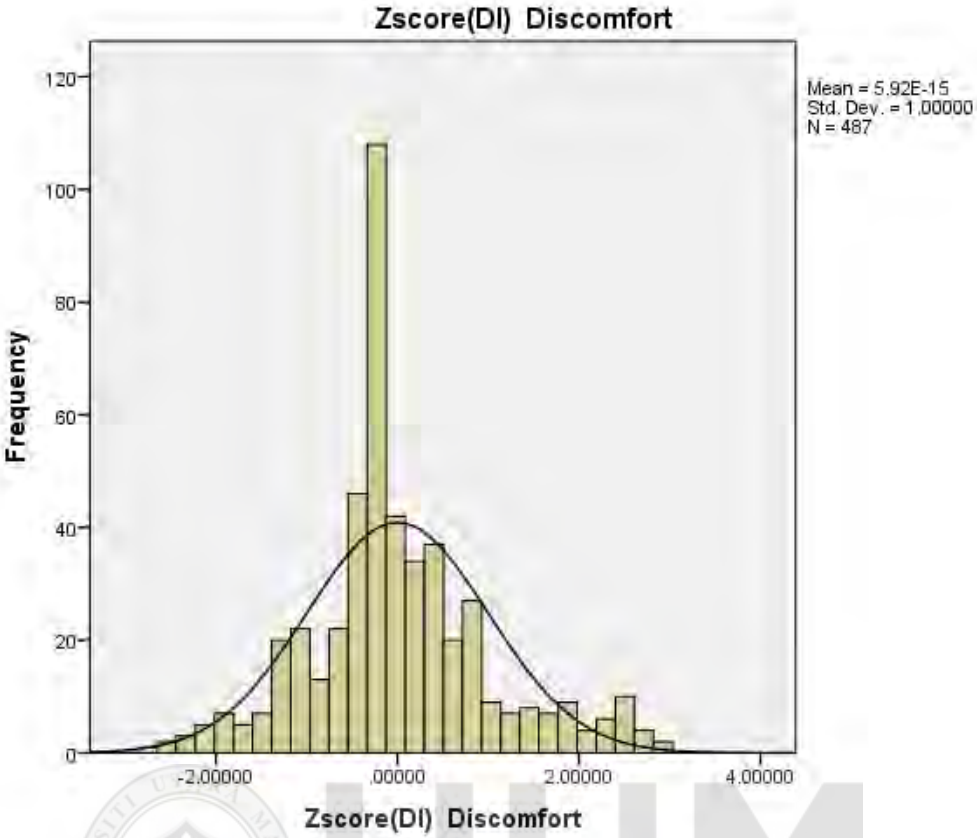
Zscore: IY3 I think e-wallet transaction via QR code is not safe for me to do any financial transaction online.	487	-2.25758	1.80941
Zscore: IY4 I do not feel confident in doing business with a place that can be reached online including e-wallet transaction via QR code.	487	-2.25853	1.79766
Zscore: IY5 I think e-wallet transaction via QR code is not safe for me to expose my financial information online.	487	-2.58530	1.80160
Zscore: FC1 I think I have the necessary resources to use e-wallet transaction via QR code.	487	-2.82226	1.47287
Zscore: FC2 I feel that I have the necessary knowledge to use e-wallet transaction via QR code.	487	-3.07164	1.48900
Zscore: FC3 I think a specified information and support is available in case of difficulty to use e-wallet transaction via QR code.	487	-2.74359	1.50483
Zscore: FC4 I think using the e-wallet transaction via QR code will fit into my work style.	487	-2.79425	1.55567
Zscore: FC5 I believe that I have enough internet experience to use e-wallet transaction via QR code.	487	-2.64524	1.50143
Zscore: EE1 I think it is easy for me to understand the e-wallet transaction via QR code.	487	-3.34567	1.40691
Zscore: EE2 I think it is easy for me to use e-wallet transaction via QR code.	487	-3.20118	1.40436
Zscore: EE3 I think it is easy for me to learn e-wallet transaction via QR code.	487	-3.52505	1.37048
Zscore: EE4 I think it is easy for me to become skilful at using e-wallet transaction via QR code.	487	-3.52989	1.37236
Zscore: EE5 I think my interaction with e-wallet transaction via QR code would be easy for me.	487	-3.44469	1.38515
Zscore: PE1 I believe that e-wallet transaction via QR code will be very useful in my life.	487	-3.22303	1.33980
Zscore: PE2 I think using e-wallet transaction via QR code will enable me to accomplish a transaction more quickly.	487	-3.70133	1.40745
Zscore: PE3 I think e-wallet transaction via QR code will enhance my life efficiency.	487	-3.21682	1.50183
Zscore: PE4 I think e-wallet transaction via QR code would enable me to access it anytime when I need it.	487	-3.58618	1.31734
Zscore: PE5 I think e-wallet transaction via QR code could enhance the level of convenience in accessing banking services.	487	-2.94772	1.36840

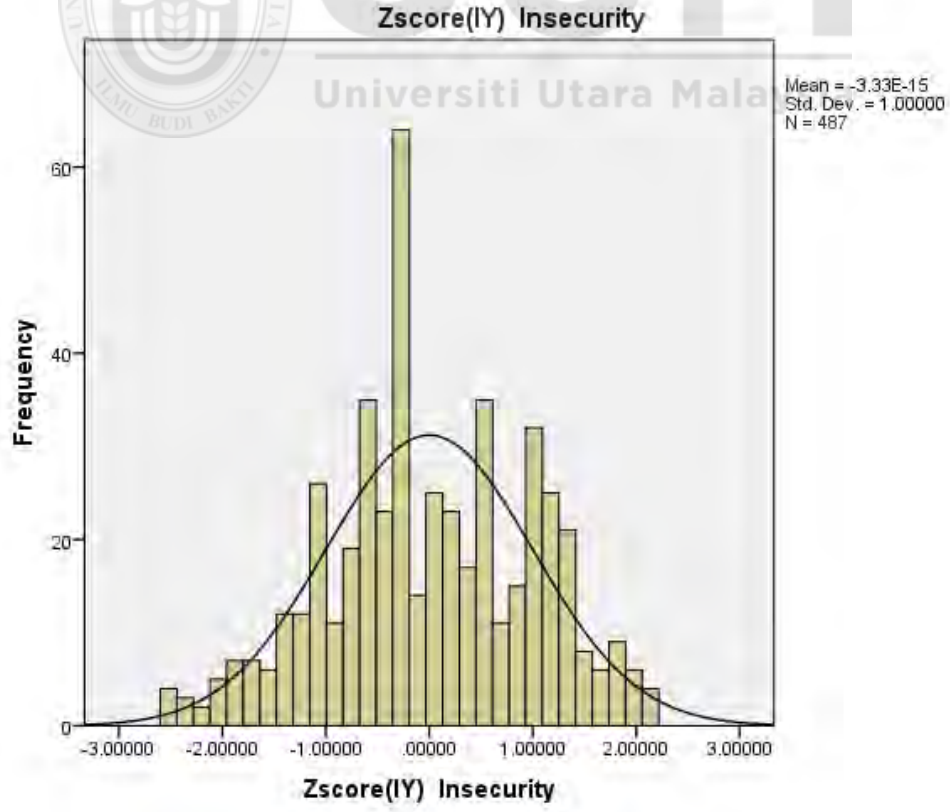
Zscore: SI1 I believe that people in my community will think that I should use e-wallet transaction via QR code.	487	-2.93205	1.44133
Zscore: SI2 I feel that people who are important to me will think that I should use e-wallet transaction via QR code.	487	-2.97692	1.49995
Zscore: SI3 I believe that my community will support me to use e-wallet transaction via QR code.	487	-2.67703	1.45737
Zscore: SI4 I feel that using e-wallet transaction via QR code will enhance my knowledge about the environment.	487	-2.59656	1.52018
Zscore: SI5 I feel that people who use e-wallet transaction via QR code have more prestige.	487	-2.41292	1.49537
Zscore: BI1 I think I would like to use e-wallet transaction via QR code.	487	-3.28665	1.34829
Zscore: BI2 I would feel good about using e-wallet transaction via QR code.	487	-3.57701	1.43355
Zscore: BI3 I think positively toward using e-wallet transaction via QR code.	487	-3.48923	1.33820
Zscore: BI4 I think I have the intention to use e-wallet transaction via QR code.	487	-3.77288	1.45937
Zscore: BI5 I predict that I would use e-wallet transaction via QR code.	487	-3.69766	1.40124
Zscore: BI6 I plan to use e-wallet transaction via QR code.	487	-3.14704	1.46092
Zscore: BI7 I guess I intend to be a heavy user of e-wallet transaction via QR code.	487	-3.92327	1.40377
Zscore: BI8 I think I have the intention to use e-wallet transaction via QR code in the near future.	487	-3.92146	1.38340
Zscore: BI9 I think I am willing to use e-wallet transaction via QR code.	487	-3.57428	1.37551
Zscore: BI10 I guess I will use e-wallet transaction via QR code in regular basic in the near future.	487	-3.65012	1.38085
Valid N (listwise)	487		

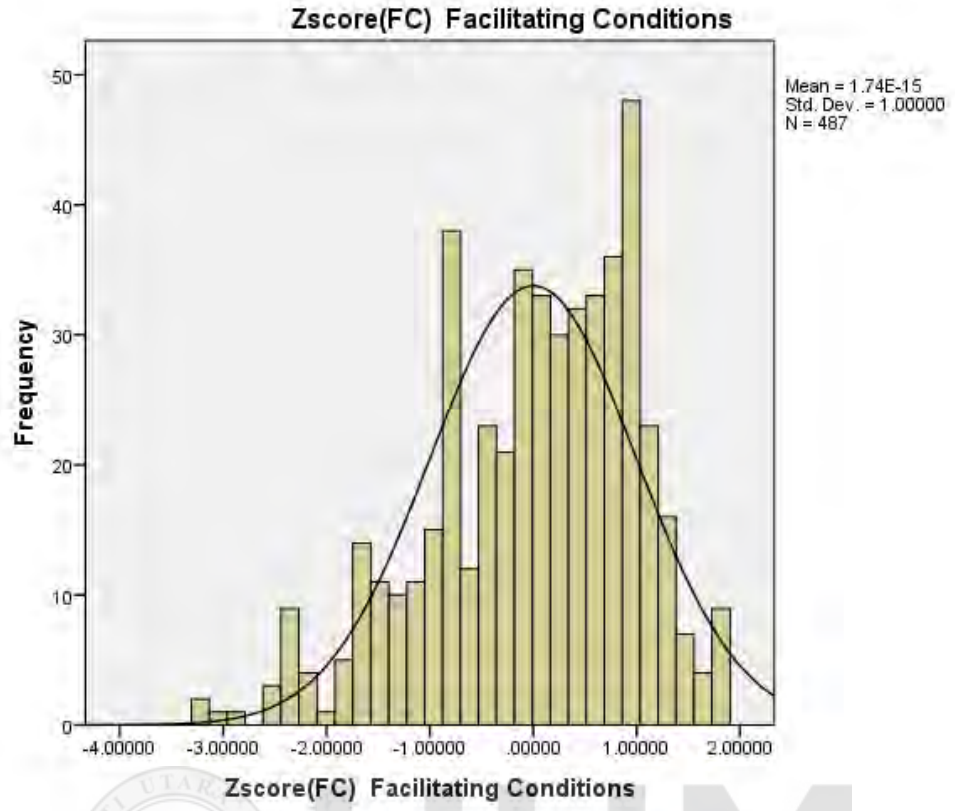
Appendix F2: Outlier Detection

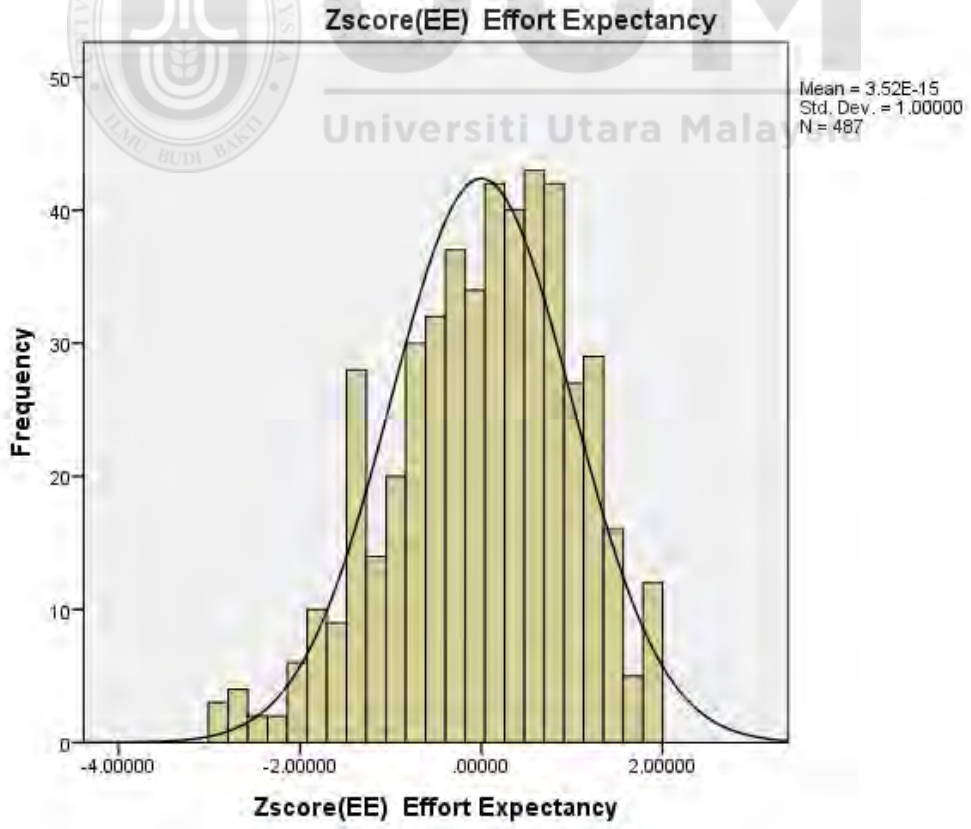


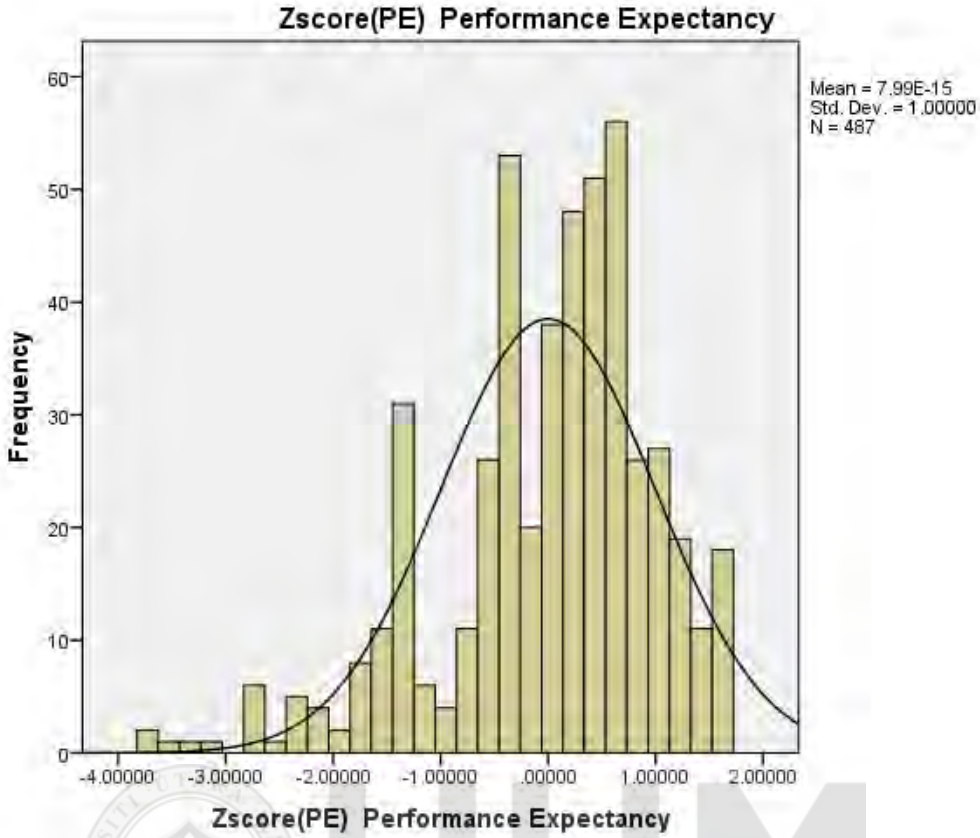


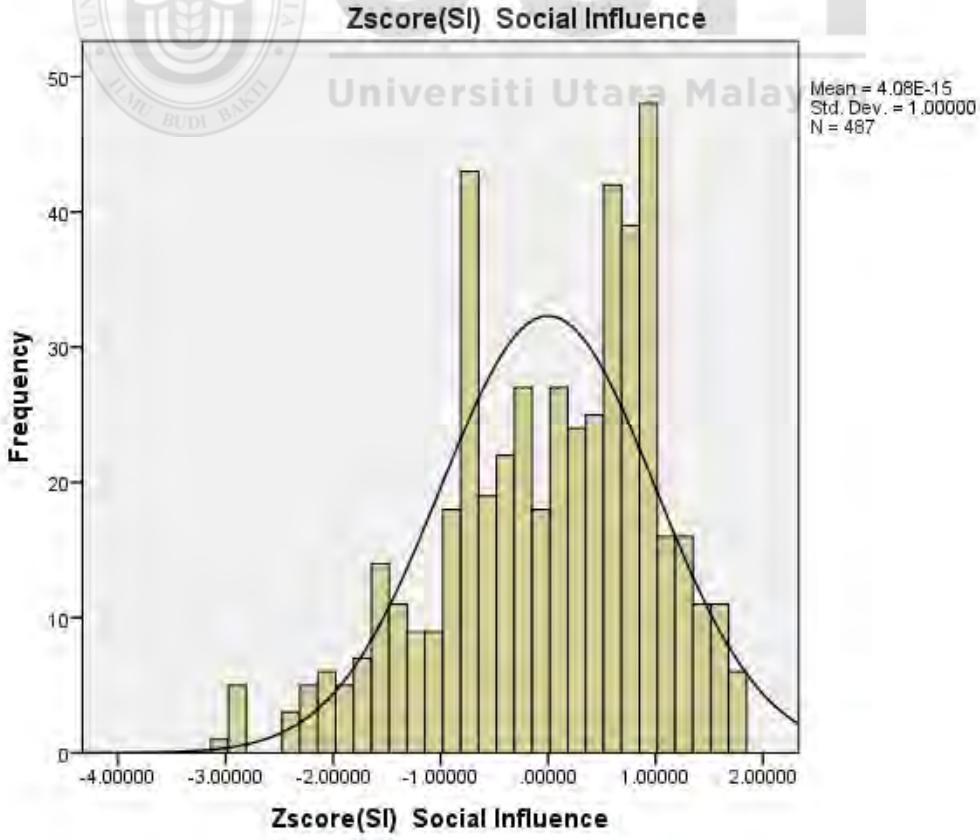


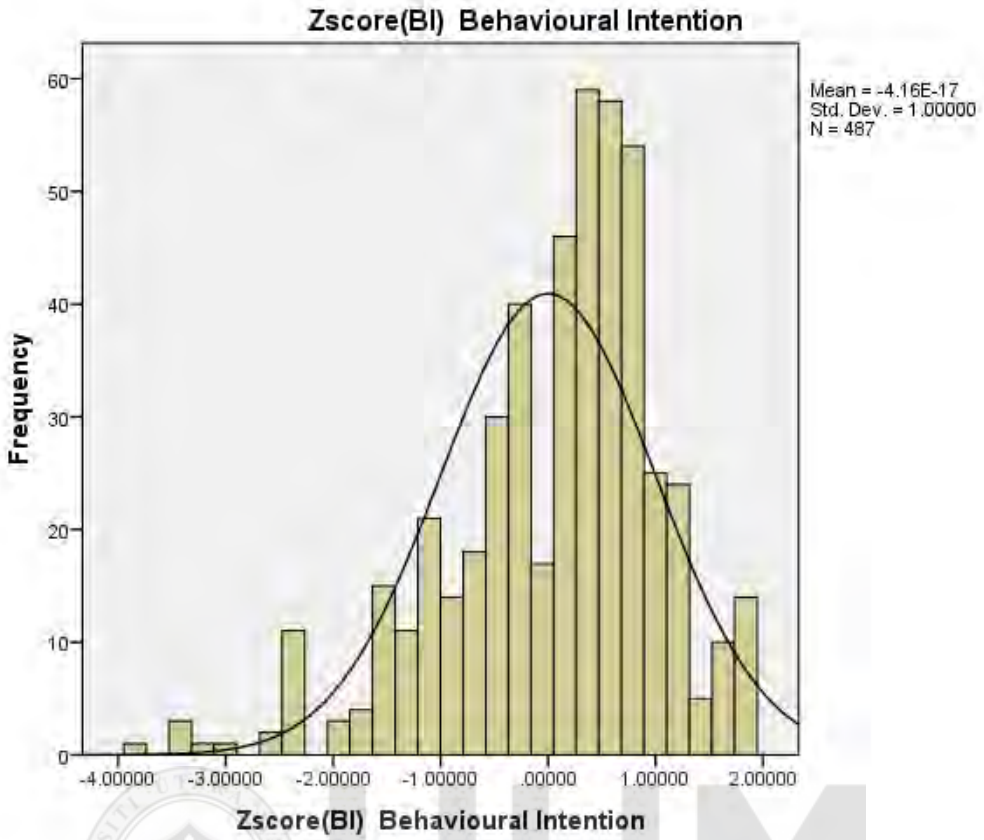












Appendix G: Normality Measurement of Items

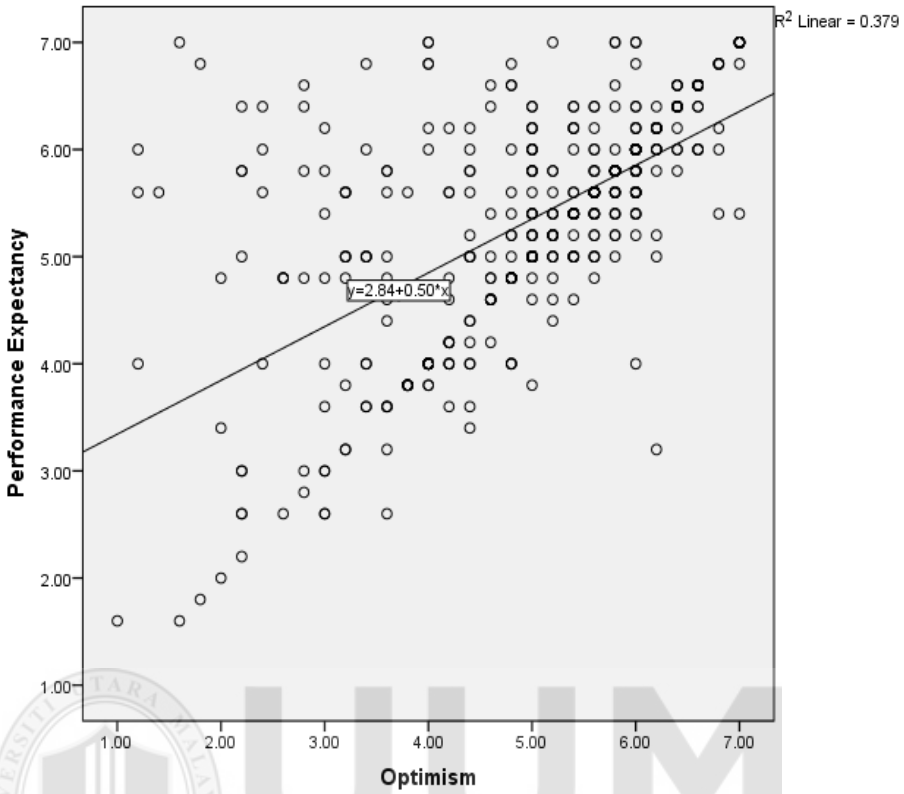
Items	Skewness		Kurtosis	
	Statistic	Std. Error	Statistic	Std. Error
OP1 I think e-wallet transaction via QR code will give me more freedom of mobility.	-.870	.111	.630	.221
OP2 I feel that e-wallet transaction via QR code is the newest technology that is much more convenient to use.	-.796	.111	.360	.221
OP3 I think e-wallet transaction via QR code will be mentally stimulating.	-.879	.111	.440	.221
OP4 I think e-wallet transaction via QR code will allow me to tailor things to fit my own needs.	-.922	.111	.318	.221
OP5 I think e-wallet transaction via QR code will make me more efficient in my profession.	-.940	.111	.207	.221
IN1 I feel that I can figure out e-wallet transaction via QR code without help from others.	-.840	.111	-.024	.221
IN2 I feel that other people will come to me for advice on e-wallet transaction via QR code.	-.919	.111	.631	.221
IN3I feel that I will have fewer problems than other people in making e-wallet transaction via QR code work for me.	-.884	.111	.501	.221
IN4 I feel that I can keep up with the e-wallet transaction via QR code in my area of interest.	-.837	.111	.576	.221
IN5 I think I will be the first in my circle of friends to adopt e-wallet transaction via QR code.	-.946	.111	.530	.221
DI1 I think that e-wallet transaction via QR code is not designed for use by ordinary people.	.148	.111	.996	.221
DI2 I think it is embarrassing when I have trouble with e-wallet transaction via QR code while people are watching.	.046	.111	.826	.221
DI3 I feel that e-wallet transaction via QR code will seem to fail at the worst possible time.	.255	.111	.547	.221
DI4 I think that the instruction of e-wallet transaction via QR code is not easy to understand.	.290	.111	.509	.221
DI5 I feel that e-wallet transaction via QR code has risks that are not discovered until after people have used it.	.339	.111	.281	.221
IY1 I feel that e-wallet transaction via QR code is not safe for me to provide my financial information over a mobile phone.	-.275	.111	-.377	.221
IY2 I think e-wallet transaction via QR code will lower the quality of relationships by reducing personal interaction.	-.366	.111	-.169	.221

IY3 I think e-wallet transaction via QR code is not safe for me to do any financial transaction online.	-.231	.111	-.386	.221
IY4 I do not feel confident in doing business with a place that can be reached online including e-wallet transaction via QR code.	-.306	.111	-.395	.221
IY5 I think e-wallet transaction via QR code is not safe for me to expose my financial information online.	-.076	.111	-.738	.221
FC1 I think I have the necessary resources to use e-wallet transaction via QR code.	-.638	.111	-.114	.221
FC2 I feel that I have the necessary knowledge to use e-wallet transaction via QR code.	-.697	.111	.302	.221
FC3 I think a specified information and support is available in case of difficulty to use e-wallet transaction via QR code.	-.455	.111	-.267	.221
FC4 I think using the e-wallet transaction via QR code will fit into my work style.	-.582	.111	.028	.221
FC5 I believe that I have enough internet experience to use e-wallet transaction via QR code.	-.556	.111	-.087	.221
EE1 I think it is easy for me to understand the e-wallet transaction via QR code.	-.841	.111	.850	.221
EE2 I think it is easy for me to use e-wallet transaction via QR code.	-.762	.111	.585	.221
EE3 I think it is easy for me to learn e-wallet transaction via QR code.	-.684	.111	.529	.221
EE4 I think it is easy for me to become skilful at using e-wallet transaction via QR code.	-.813	.111	.982	.221
EE5 I think my interaction with e-wallet transaction via QR code would be easy for me.	-.839	.111	.851	.221
PE1 I believe that e-wallet transaction via QR code will be very useful in my life.	-.931	.111	1.018	.221
PE2 I think using e-wallet transaction via QR code will enable me to accomplish a transaction more quickly.	-.884	.111	1.238	.221
PE3 I think e-wallet transaction via QR code will enhance my life efficiency.	-.530	.111	.236	.221
PE4 I think e-wallet transaction via QR code would enable me to access it anytime when I need it.	-.991	.111	1.249	.221
PE5 I think e-wallet transaction via QR code could enhance the level of convenience in accessing banking services.	-.872	.111	.879	.221
SI1 I believe that people in my community will think that I should use e-wallet transaction via QR code.	-.718	.111	.183	.221
SI2 I feel that people who are important to me will think that I should use e-wallet transaction via QR code.	-.543	.111	-.217	.221

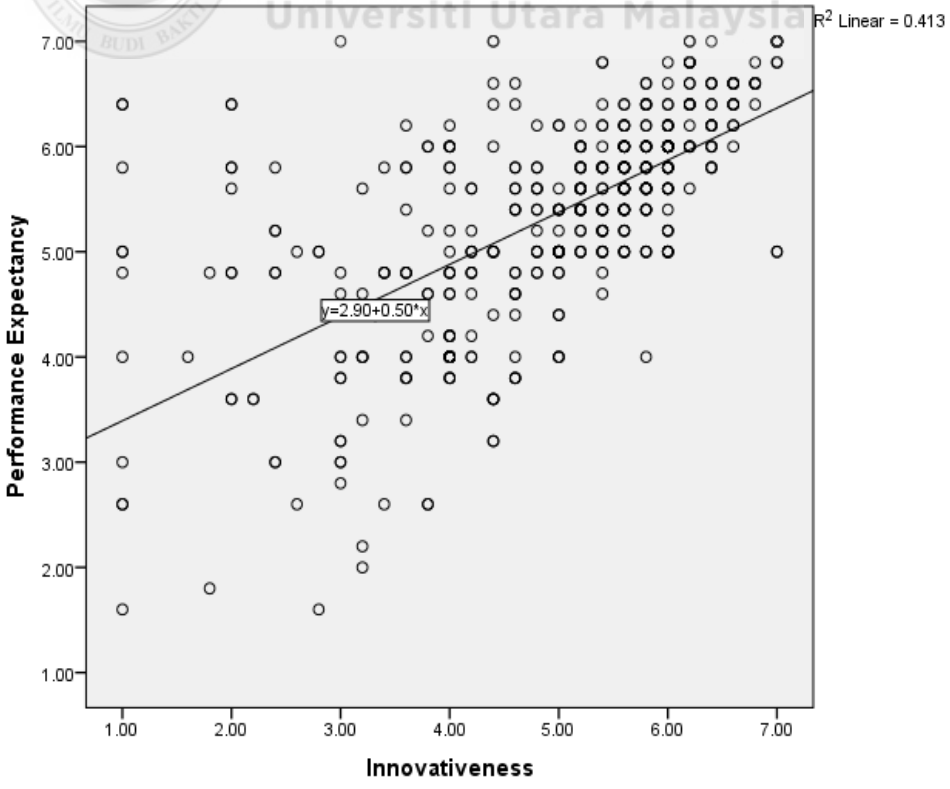
SI3 I believe that my community will support me to use e-wallet transaction via QR code.	-.610	.111	-.040	.221
SI4 I feel that using e-wallet transaction via QR code will enhance my knowledge about the environment.	-.626	.111	-.041	.221
SI5 I feel that people who use e-wallet transaction via QR code have more prestige.	-.584	.111	-.094	.221
BI1 I think I would like to use e-wallet transaction via QR code.	-.951	.111	.850	.221
BI2 I would feel good about using e-wallet transaction via QR code.	-.871	.111	.974	.221
BI3 I think positively toward using e-wallet transaction via QR code.	-.847	.111	.830	.221
BI4 I think I have the intention to use e-wallet transaction via QR code.	-.836	.111	.978	.221
BI5 I predict that I would use e-wallet transaction via QR code.	-.808	.111	1.004	.221
BI6 I plan to use e-wallet transaction via QR code.	-.629	.111	.444	.221
BI7 I guess I intend to be a heavy user of e-wallet transaction via QR code.	-.860	.111	1.302	.221
BI8 I think I have the intention to use e-wallet transaction via QR code in the near future.	-.786	.111	1.075	.221
BI9 I think I am willing to use e-wallet transaction via QR code.	-.938	.111	1.470	.221
BI10 I guess I will use e-wallet transaction via QR code in regular basic in the near future.	-.965	.111	1.419	.221

Appendix H: Linearity

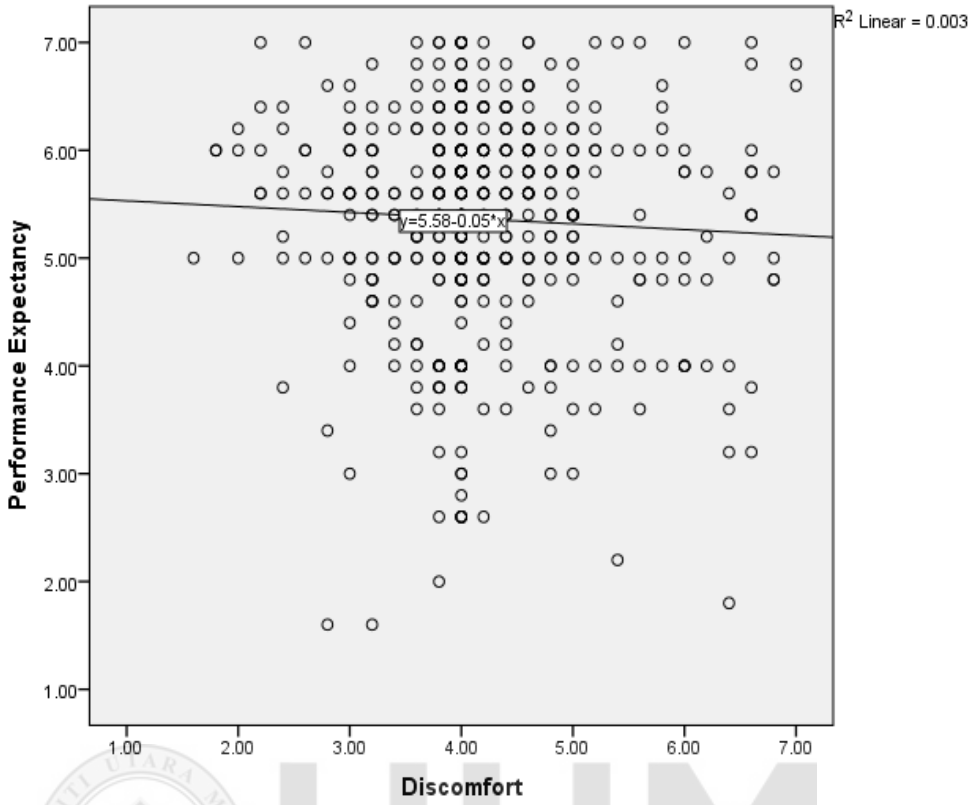
Scatter-Plot of Optimism and Performance Expectancy:



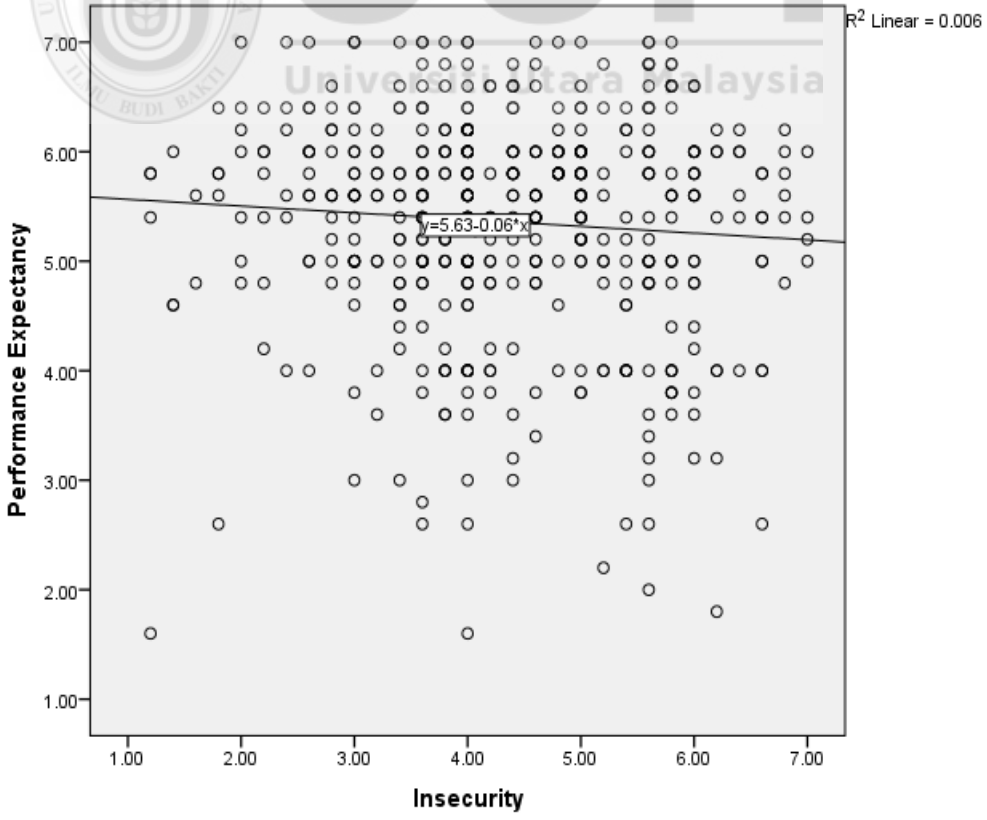
Scatter-Plot of Innovativeness and Performance Expectancy:



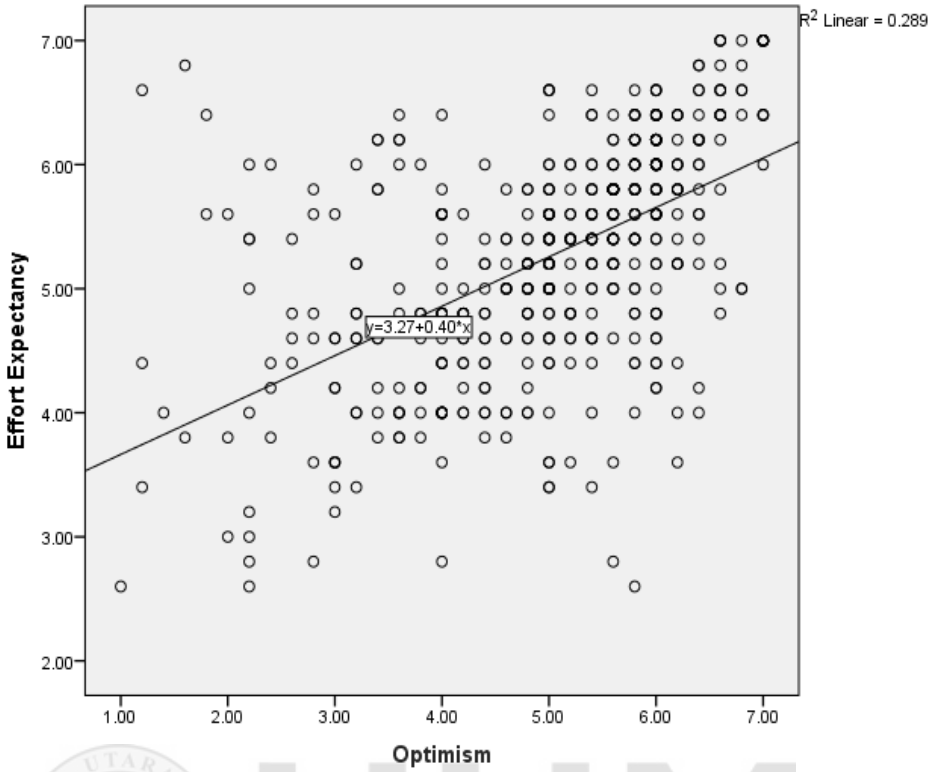
Scatter-Plot of Discomfort and Performance Expectancy:



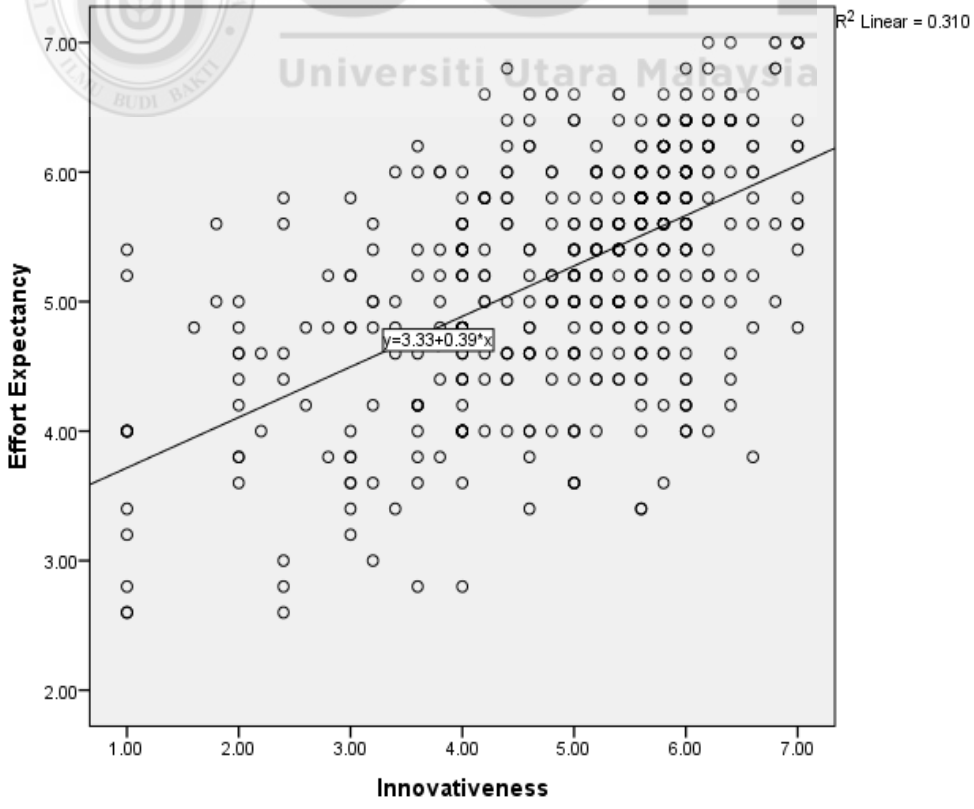
Scatter-Plot of Insecurity and Performance Expectancy:



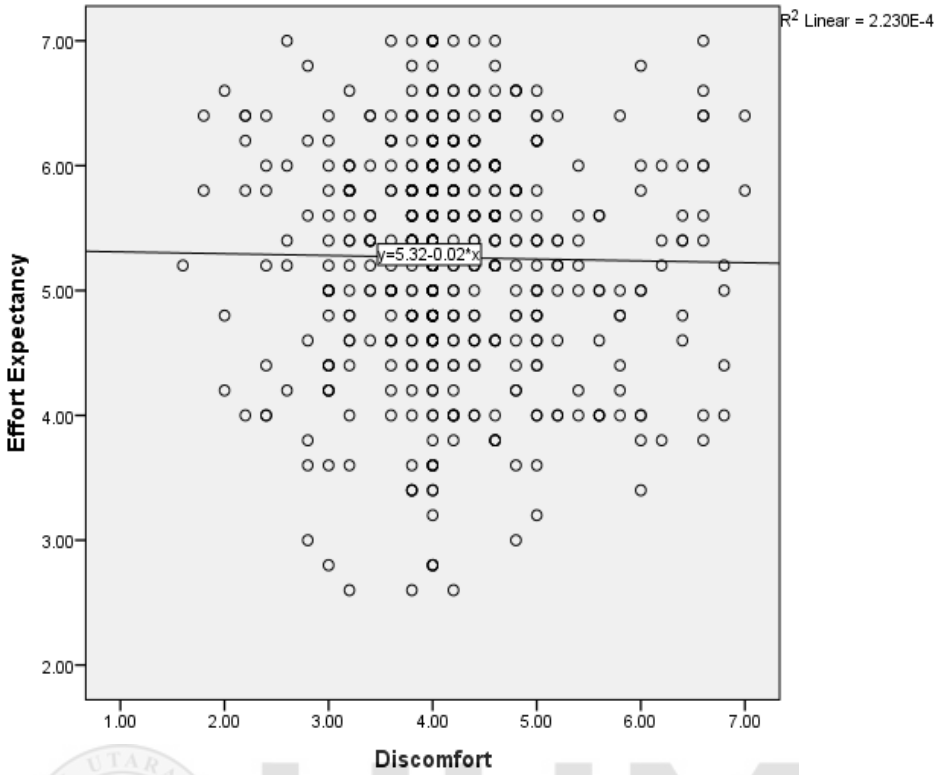
Scatter-Plot of Optimism and Effort Expectancy:



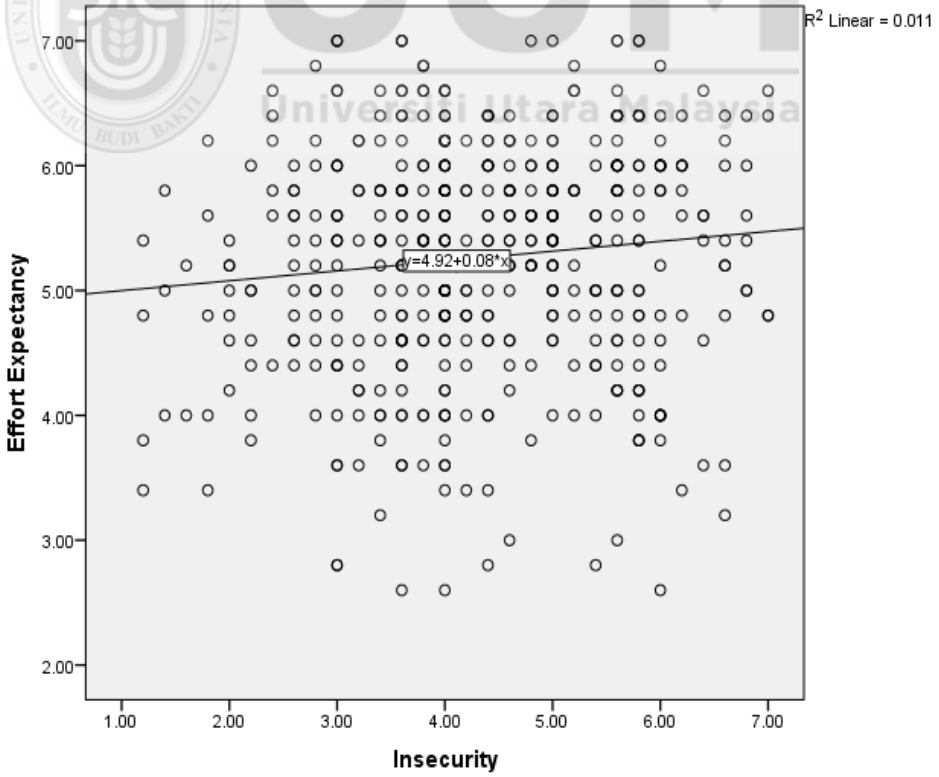
Scatter-Plot of Innovativeness and Effort Expectancy:



Scatter-Plot of Discomfort and Effort Expectancy:



Scatter-Plot of Insecurity and Effort Expectancy:



Appendix I: Communalities

Items	Initial	Extraction
OP1 I think e-wallet transaction via QR code will give me more freedom of mobility.	1.000	.638
OP2 I feel that e-wallet transaction via QR code is the newest technology that is much more convenient to use.	1.000	.764
OP3 I think e-wallet transaction via QR code will be mentally stimulating.	1.000	.766
OP4 I think e-wallet transaction via QR code will allow me to tailor things to fit my own needs.	1.000	.789
OP5 I think e-wallet transaction via QR code will make me more efficient in my profession.	1.000	.773
IN1 I feel that I can figure out e-wallet transaction via QR code without help from others.	1.000	.765
IN2 I feel that other people will come to me for advice on e-wallet transaction via QR code.	1.000	.794
IN3I feel that I will have fewer problems than other people in making e-wallet transaction via QR code work for me.	1.000	.739
IN4 I feel that I can keep up with the e-wallet transaction via QR code in my area of interest.	1.000	.805
IN5 I think I will be the first in my circle of friends to adopt e-wallet transaction via QR code.	1.000	.828
DI1 I think that e-wallet transaction via QR code is not designed for use by ordinary people.	1.000	.723
DI2 I think it is embarrassing when I have trouble with e-wallet transaction via QR code while people are watching.	1.000	.730
DI3 I feel that e-wallet transaction via QR code will seem to fail at the worst possible time.	1.000	.757
DI4 I think that the instruction of e-wallet transaction via QR code is not easy to understand.	1.000	.795
DI5 I feel that e-wallet transaction via QR code has risks that are not discovered until after people have used it.	1.000	.765
IY1 I feel that e-wallet transaction via QR code is not safe for me to provide my financial information over a mobile phone.	1.000	.717
IY2 I think e-wallet transaction via QR code will lower the quality of relationships by reducing personal interaction.	1.000	.762
IY3 I think e-wallet transaction via QR code is not safe for me to do any financial transaction online.	1.000	.803

IY4 I do not feel confident in doing business with a place that can be reached online including e-wallet transaction via QR code.	1.000	.813
IY5 I think e-wallet transaction via QR code is not safe for me to expose my financial information online.	1.000	.705
FC1 I think I have the necessary resources to use e-wallet transaction via QR code.	1.000	.745
FC2 I feel that I have the necessary knowledge to use e-wallet transaction via QR code.	1.000	.725
FC3 I think a specified information and support is available in case of difficulty to use e-wallet transaction via QR code.	1.000	.782
FC4 I think using the e-wallet transaction via QR code will fit into my work style.	1.000	.773
FC5 I believe that I have enough internet experience to use e-wallet transaction via QR code.	1.000	.689
EE1 I think it is easy for me to understand the e-wallet transaction via QR code.	1.000	.746
EE2 I think it is easy for me to use e-wallet transaction via QR code.	1.000	.791
EE3 I think it is easy for me to learn e-wallet transaction via QR code.	1.000	.635
EE4 I think it is easy for me to become skilful at using e-wallet transaction via QR code.	1.000	.696
EE5 I think my interaction with e-wallet transaction via QR code would be easy for me.	1.000	.719
PE1 I believe that e-wallet transaction via QR code will be very useful in my life.	1.000	.761
PE2 I think using e-wallet transaction via QR code will enable me to accomplish a transaction more quickly.	1.000	.757
PE3 I think e-wallet transaction via QR code will enhance my life efficiency.	1.000	.701
PE4 I think e-wallet transaction via QR code would enable me to access it anytime when I need it.	1.000	.750
PE5 I think e-wallet transaction via QR code could enhance the level of convenience in accessing banking services.	1.000	.752
SI1 I believe that people in my community will think that I should use e-wallet transaction via QR code.	1.000	.765
SI2 I feel that people who are important to me will think that I should use e-wallet transaction via QR code.	1.000	.701
SI3 I believe that my community will support me to use e-wallet transaction via QR code.	1.000	.797

SI4 I feel that using e-wallet transaction via QR code will enhance my knowledge about the environment.	1.000	.816
SI5 I feel that people who use e-wallet transaction via QR code have more prestige.	1.000	.748
BI1 I think I would like to use e-wallet transaction via QR code.	1.000	.755
BI2 I would feel good about using e-wallet transaction via QR code.	1.000	.672
BI3 I think positively toward using e-wallet transaction via QR code.	1.000	.739
BI4 I think I have the intention to use e-wallet transaction via QR code.	1.000	.698
BI5 I predict that I would use e-wallet transaction via QR code.	1.000	.636
BI6 I plan to use e-wallet transaction via QR code.	1.000	.668
BI7 I guess I intend to be a heavy user of e-wallet transaction via QR code.	1.000	.658
BI8 I think I have the intention to use e-wallet transaction via QR code in the near future.	1.000	.661
BI9 I think I am willing to use e-wallet transaction via QR code.	1.000	.678
BI10 I guess I will use e-wallet transaction via QR code in regular basic in the near future.	1.000	.701

Extraction Method: Principal Component Analysis.

Appendix J: **Descriptive Statistics of Measurement Items**

Measurements Items	Minimum	Maximum	Mean	Std. Deviation
OP1 I think e-wallet transaction via QR code will give me more freedom of mobility.	1	7	5.13	1.349
OP2 I feel that e-wallet transaction via QR code is the newest technology that is much more convenient to use.	1	7	5.06	1.375
OP3 I think e-wallet transaction via QR code will be mentally stimulating.	1	7	5.10	1.434
OP4 I think e-wallet transaction via QR code will allow me to tailor things to fit my own needs.	1	7	4.93	1.524
OP5 I think e-wallet transaction via QR code will make me more efficient in my profession.	1	7	4.86	1.631
IN1 I feel that I can figure out e-wallet transaction via QR code without help from others.	1	7	4.98	1.584
IN2 I feel that other people will come to me for advice on e-wallet transaction via QR code.	1	7	5.00	1.419
IN3I feel that I will have fewer problems than other people in making e-wallet transaction via QR code work for me.	1	7	4.99	1.429
IN4 I feel that I can keep up with the e-wallet transaction via QR code in my area of interest.	1	7	4.90	1.420
IN5 I think I will be the first in my circle of friends to adopt e-wallet transaction via QR code.	1	7	4.96	1.515
DI1 I think that e-wallet transaction via QR code is not designed for use by ordinary people.	1	7	4.12	1.120
DI2 I think it is embarrassing when I have trouble with e-wallet transaction via QR code while people are watching.	1	7	4.08	1.151
DI3 I feel that e-wallet transaction via QR code will seem to fail at the worst possible time.	1	7	4.28	1.135
DI4 I think that the instruction of e-wallet transaction via QR code is not easy to understand.	1	7	4.30	1.099
DI5 I feel that e-wallet transaction via QR code has risks that are not discovered until after people have used it.	1	7	4.31	1.143
IY1 I feel that e-wallet transaction via QR code is not safe for me to	1	7	4.29	1.456

provide my financial information over a mobile phone.				
IY2 I think e-wallet transaction via QR code will lower the quality of relationships by reducing personal interaction.	1	7	4.19	1.499
IY3 I think e-wallet transaction via QR code is not safe for me to do any financial transaction online.	1	7	4.33	1.475
IY4 I do not feel confident in doing business with a place that can be reached online including e-wallet transaction via QR code.	1	7	4.34	1.479
IY5 I think e-wallet transaction via QR code is not safe for me to expose my financial information online.	1	7	4.54	1.368
FC1 I think I have the necessary resources to use e-wallet transaction via QR code.	1	7	4.94	1.397
FC2 I feel that I have the necessary knowledge to use e-wallet transaction via QR code.	1	7	5.04	1.316
FC3 I think a specified information and support is available in case of difficulty to use e-wallet transaction via QR code.	1	7	4.87	1.412
FC4 I think using the e-wallet transaction via QR code will fit into my work style.	1	7	4.85	1.379
FC5 I believe that I have enough internet experience to use e-wallet transaction via QR code.	1	7	4.83	1.447
EE1 I think it is easy for me to understand the e-wallet transaction via QR code.	1	7	5.22	1.262
EE2 I think it is easy for me to use e-wallet transaction via QR code.	1	7	5.17	1.303
EE3 I think it is easy for me to learn e-wallet transaction via QR code.	1	7	5.32	1.226
EE4 I think it is easy for me to become skilful at using e-wallet transaction via QR code.	1	7	5.32	1.224
EE5 I think my interaction with e-wallet transaction via QR code would be easy for me.	1	7	5.28	1.242
PE1 I believe that e-wallet transaction via QR code will be very useful in my life.	1	7	5.24	1.315
PE2 I think using e-wallet transaction via QR code will enable me to accomplish a transaction more quickly.	1	7	5.35	1.174

PE3 I think e-wallet transaction via QR code will enhance my life efficiency.	2	7	5.41	1.060
PE4 I think e-wallet transaction via QR code would enable me to access it anytime when I need it.	1	7	5.39	1.224
PE5 I think e-wallet transaction via QR code could enhance the level of convenience in accessing banking services.	2	7	5.41	1.158
SI1 I believe that people in my community will think that I should use e-wallet transaction via QR code.	1	7	5.02	1.372
SI2 I feel that people who are important to me will think that I should use e-wallet transaction via QR code.	1	7	4.99	1.340
SI3 I believe that my community will support me to use e-wallet transaction via QR code.	1	7	4.89	1.451
SI4 I feel that using e-wallet transaction via QR code will enhance my knowledge about the environment.	1	7	4.78	1.457
SI5 I feel that people who use e-wallet transaction via QR code have more prestige.	1	7	4.70	1.535
BI1 I think I would like to use e-wallet transaction via QR code.	1	7	5.25	1.295
BI2 I would feel good about using e-wallet transaction via QR code.	1	7	5.28	1.197
BI3 I think positively toward using e-wallet transaction via QR code.	1	7	5.34	1.243
BI4 I think I have the intention to use e-wallet transaction via QR code.	1	7	5.33	1.147
BI5 I predict that I would use e-wallet transaction via QR code.	1	7	5.35	1.177
BI6 I plan to use e-wallet transaction via QR code.	2	7	5.41	1.085
BI7 I guess I intend to be a heavy user of e-wallet transaction via QR code.	1	7	5.42	1.126
BI8 I think I have the intention to use e-wallet transaction via QR code in the near future.	1	7	5.44	1.131
BI9 I think I am willing to use e-wallet transaction via QR code.	1	7	5.33	1.212
BI10 I guess I will use e-wallet transaction via QR code in regular basic in the near future.	1	7	5.35	1.193